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GENERAL

ATOMIC POWER

1701

NUCLEAR POWER PRODUCTION AND UTILISATION. IV. THE LONG-TERM PROGRAMME FOR ATOMIC POWER PRODUCTION. E. W. Titterton (Australian National Univ., Canberra). Atomics 6, 10-13(1955) Jan.

Technical problems associated with a long-term program for atomic power production, based on the economics of a breeder reactor are discussed. (K.S.)

1702

RADIOACTIVE WASTE PRODUCTS IN FOOD STERILISATION. A NEW USE FOR FISSION PRODUCTS. Atomics 6, 19-20(1955) Jan.

BIOLOGY AND MEDICINE

1703

Hanford Works

GASTRO-INTESTINAL ABSORPTION OF PLUTONIUM. 2. COMPARISON BETWEEN RAT AND PIG. M[aurice] H. Weeks, L. A. George, W. D. Oakley, L. K. Bustad, and R[oy] C. Thompson. Nov. 15, 1954. 14p. Contract W-31-109-Eng-52. (HW-33744)

In single-feeding experiments the absorption of plutonium from the gastro-intestinal tract of three pigs averaged 0.0022 per cent, with 95 per cent confidence limits of ± 0.0013. This figure did not differ significantly from the results of more extensive single feeding and chronic feeding experiments on rats. Plutonium absorbed and excreted in the urine of rats amounted to less than 20 per cent of the total plutonium absorbed. Less than one per cent of plutonium fed to rats remained in the animals two days after feeding. (For preceding report in series see HW-30220.) (auth)

1704

Johns Hopkins Univ.

AN EVALUATION OF LAUNDERING AGENTS AND TECHNIQUES USED IN THE DECONTAMINATION OF COTTON CLOTHING. Albert P. Talboys and Eugene C. Spratt. Mar. 1, 1954. 114p. Contract AT(30-1)-1947. (NYO-4990)

An evaluation was made of laundering agents used in the decontamination of clothing, with a view to employment in the laundry of agents which are effective decontaminants and still amenable to treatment by economical biological processes. Techniques were determined, including dry-cleaning methods, affording maximum decontaminating efficiency at the same time resulting in a minimum volume of waste to be evaporated. (L.T.W.)

1705

Atomic Energy Project, Univ. of Rochester

THE EFFECTS OF A MAINTAINED BODY BURDEN OF POLONIUM IN THE RAT. 2. PLAN OF LONG TERM EXPERIMENT, DISTRIBUTION, EXCRETION AND RETENTION DATA. J. N[ewell] Stannard and R[obert] C. Baxter. Nov. 22, 1954. 33p. Contract W-7401-eng-49. (UR-376)

Detailed plans are given for a three year, life span experiment to determine the effects of a maintained body burden of Po^{210} in the rat. Four dosage levels were chosen to cover a range between one expected to produce little or no biological change to one expected to result in considerable radiation damage. They are nominally 0.023, 0.1, 0.3, and 1.5 μc per kilogram per month given intravenously as neutralized solutions. The basis for choice of animals, route of administration, and the experimental design is discussed. The mean body contents at equilibrium were found to be approximately twice the monthly dose. Earlier assumptions predicted that it should be between 1.25 and 1.5 times the monthly dose. This difference is most readily accounted for by the presence of a longer effective half life than the assumed value (40 days rather than 30 days) and may represent in part less rapid excretion of the polonium than expected from single dose experiments. Actual measurements of excretion rates were performed as a "spot check" at the two lower dosage levels and found to be slightly lower than the rates predicted from conservative criteria. Some very high retentions were seen which may indicate delayed excretion resulting from tissue damage. Tissue contents of polonium were maintained throughout the experiment in a pattern similar to that seen in the first month after a single intravenous dose. The redistribution with time seen after a single dose does not occur. Spleen, liver, and kidney remained high throughout the exposure period, predicting greater damage per μc of polonium disintegrating in the body than after a single dose. (For preceding report in series see UR-329.) (auth)

1706

PHYSIOPATHOLOGY OF MAST CELLS. (Heparin Storage and Elimination). Ruth Frick. Translated from Acta Haematol. 4, 97-109(1950). 21p. (AEC-tr-1997)

A simple method is described by which the morphology of the heparin storage and elimination can be followed in the mast cells and which allows us at the same time to estimate the mast cells quantitatively. Experiments with intraperitoneal heparin injection were performed in mice with the result that a new formation of mast cells started from the adventitia cells in the mesentery. The authors describe how the mast cells pour out their heparin after injection of thrombokinase by eliminating their granula. The action of thrombokinase probably represents a shock effect. (auth)

1707

THE ELECTRON-MICROSCOPIC PREPARATION OF ELASTIC TISSUE ELEMENTS. C. Wolpers. Translated by R. J. Richardson from Klin. Wochschr. 23, 169-72(1944). 5p. (AERE-Lib/Trans-486)

Normal elastic tissue elements, particularly from mouse aortas, were investigated with the electron microscope. Elastic fibers with membrane-shaped broadening and elastic membranes with short embedded elastic fibers can be differentiated. The elastic tissue elements are mostly homogeneous. A truly fibrillar fine structure composed of ultramolecular independent units, such as are found with collagen fibers, could not be found. After different pretreatment different forms of linear structure parallel to the fiber direction can be detected. This finding, however, holds for a fibrous arrangement in the molecular size region which remains directly invisible in the electron microscope. The orcein staining of elastic tissue elements also has importance for electron microscopy. (auth)

1708

ASSOCIATION OF POLONIUM-210 WITH BLOOD. J. E. Campbell and L. H. Talley (Mound Lab., Miamisburg, Ohio). Proc. Soc. Exptl. Biol. Med. 87, 221-3(1954) Oct.

When whole blood from polonium-injected rats or dogs was centrifugally fractionated, it was found that approximately 90% of the polonium was associated with the red blood cells. Isolation of hemoglobin from similar blood indicated that the polonium was associated with this portion of the red blood cell. Fractionation of hemoglobin into globin and heme indicated that almost all of the polonium was associated with the globin. Measurement of the affinity of major red blood cell components for polonium demonstrated that globin had as much affinity as lysed whole red cells, while heme residue had practically none. Chemical methods which rely on a change in hydrogen ion concentration for the isolation of polonium containing red blood cell components were not satisfactory. (auth)

1709

EFFECTS OF THYROXINE AND KSCN ON CAPACITY OF RAT THYROID GLAND TO ACCUMULATE ASTATINE^{211}. C. J. Shellabarger, Patricia W. Durbin, Marshall W. Parrott, and Joseph G. Hamilton (Univ. of California, Berkeley and San Francisco). Proc. Soc. Exptl. Biol. Med. 87, 626-9(1954) Dec.

The admisistration of thyroxine to the intact female Sprague-Dawley rat resulted in a lowered thyroidal accumulation of both At^{211} and I^{131}. Since it is known that thyroxine inhibits production of TSH by the pituitary gland, it is suggested that a reduced pituitary function resulted in a reduced thyroidal accumulation of both halogens. It is further indicated that the thyroidal accumulation of At^{211} is under pituitary control. It has been demonstrated that thiocyanate blocks the thyroidal accumulation of astatide, and that since thiocyanate can discharge At^{211} from the thyroid gland, At^{211} probably is not organically bound in a manner similar to the organic binding of I^{131}. (auth)

RADIATION EFFECTS

1710

Army Medical Research Lab., Fort Knox

STUDIES ON THE INCIDENCE OF ABNORMAL LYMPHOCYTES IN THE BLOOD OF MICE AND RATS EXPOSED TO LOW DOSES OF IONIZING RADIATION. Steve Bellack and J. B. Storer. [Sept. 23, 1954]. 15p. (AMRL-162)

Mice and rats were exposed to doses of gamma or x radiation ranging from 2 to 75 r. A significant increase in the incidence of bilobed and binucleated lymphocytes in the peripheral blood occurred in all the irradiated animals. The peak incidence was found at about one week following radiation exposure. No threshold dose for production of the effect was demonstrated nor did there appear to be any correlation between dose and magnitude of response. Possible reasons for this lack of correlation were discussed. (auth)

1711

Los Alamos Scientific Lab.

STUDIES ON THE MECHANISM OF ACTION OF THERMAL NEUTRONS IN PRODUCING BIOLOGICAL EFFECTS. 2. COMPARATIVE EFFECTIVENESS IN PRODUCING INTESTINAL DAMAGE, LETHALITY, AND MARROW DAMAGE IN RATS. John B. Storer, John E. Furchner, L. Edward Ellinwood, Phyllis [C]. Sanders, and William Schweitzer. Sept. 1954. 32p. Contract W-7405-eng-36. (LA-1848)

Animals exposed to lethal doses of neutrons die earlier than animals exposed to equal rem doses of x or gamma rays when rem is determined on the basis of 30-day lethality. The thesis that this earlier death time might be due to relatively greater damage to the intestine by neutrons was investigated. The RBE of thermal neutrons in terms of x radiation was determined for the production of lethality, atrophy of the small intestine, and depression of Fe^{59} uptake by red blood cells in rats. The values for RBE were 1.4, 1.1, and 1.1, respectively, for the three effects. Comparison of the RBE of 250 kvp x rays and thermal neutrons by simple weight loss of the intestine 48 hours after exposure failed to demonstrate any unusual effectiveness of neutrons on the intestinal tract. (auth)

1712

Radiation Lab., Univ. of Calif., Berkeley

PHYSICAL STUDIES OF CELL DIVISION. STATISTICAL FLUCTUATIONS; EFFECTS DUE TO X-RADIATION, TEMPERATURE, AND HYDROSTATIC PRESSURE (thesis). Victor W. Burns. Dec. 9, 1954. 95p. Contract W-7405-eng-48. (UCRL-2812)

A technique for determining the generation times of individual yeast cells is described. Mean generation times of haploid, diploid, triploid, and tetraploid yeast cells are tabulated, and distributions of the generation times of individual cells are presented. The effect of incubation temperature on generation time and on cells dividing in synchrony is determined. The effect of x radiation on the generation times of individual cells and their progeny is studied. It is shown that ploidy does not have the same role in the division-delay effects of x radiation as it has in the lethal effects of x radiation. It is demonstrated that budding cells are resistant to the division-delay effects of x radiation. Other workers have previously demonstrated that budding cells are resistant to the lethal action of x rays. A theory of division delay is developed to fit the data. Attempts to synchronize cell division in a population of cells are described. Among the methods described are the manipulation of the physical and chemical environment of cells and the use of alternating periods of starvation and feeding. The specific sulfhydryl reagent p-chloromercuribenzoate is shown to give some protection to yeast against the lethal action of x rays. It is demonstrated that the application of high hydrostatic pressures to yeast before and during irradiation does not alter the lethal action of x rays. (auth)

1713

WHERE DOES FOOD AND DRUG PROCESSING STAND? Nucleonics 13, No. 1, 36-9(1955) Jan.

The results of a questionnaire on radiation processing sent out to ~ 40 government laboratories, educational institutions, and industrial organizations are summarized. Graphs and tables are presented on the type of radiation processing research being carried on by various institutions, the annual expenditures, the radiation sources being used, and the products most likely to be commercially radiation processed in the next 10 yrs. (M.P.G.)

1714

THE FOOD INDUSTRY'S ATTITUDE TOWARD RADIATION STERILIZATION. L. E. Clifcorn (Continental Can Co., Inc., Chicago, Ill.). Nucleonics 13, No. 1, 39-41(1955) Jan.

Radiation sterilization is evaluated by the success criteria of the food industry. Higher capital costs would be necessary. Radiation changes the taste and odor of some products and destroys some nutrients, but these problems will probably be overcome. The absence of toxicity must be established. Irradiated foods will probably have a higher shelf life and less stringent packaging requirements. Consumer acceptance must be gained. It is concluded that application of ionizing radiations in the food industry is probable within the next 10 years. (M.P.G.)

1715

HOW PROCESSING CONDITIONS AFFECT MICROORGANISM RADIORESISTANCE. S. A. Goldblith, B. E. Proctor, S. Davison, E. M. Oberle, C. J. Bates, B. Kan, O. A. Hammerle, and B. Kusmierek (Massachusetts Inst. of Tech., Cambridge). Nucleonics 13, No. 1, 42-5(1955) Jan.

Different gases in food containers, the temperature of irradiation, and the composition of food material may affect the size of the dose of ionizing radiation required for bacterial destruction in sterilizing foods. The effects of these factors have been studied using nutrient-broth suspensions of the bacteria E. coli. The methods and equipment used in the experiments are described. It was found that an oxygen atmosphere increased the radiosensitivity of E. coli. while inert or vacuum atmospheres and freezing protected the bacteria from radiation or decreased their radiosensitivity. A pea purée suspension was also found to protect the bacteria. In some cases oxygen consumption by food material was found to occur more rapidly during irradiation. (M.P.G.)

1716

MUTATIONS IN ASTASIA LONGA INDUCED BY RADIATION. Henry W. Schoenborn (Univ. of Georgia, Athens). J. Protozool. 1, 170-3(1954)

About 3,000 clones of Astasia longa J, a colorless protozoan flagellate, were available for testing for biochemical mutations. Each clone was derived from a single flagellate which had been exposed to either ultraviolet or x radiation and which had been cultured subsequent to irradiation in a complete medium. To test for biochemical mutations, an attempt was made to grow each clone in the minimal medium that suffices for the parent strain. Some clones were incapable of continuous growth in complete medium, others failed to grow or grew slowly in minimal medium, and still others grew abnormally in minimal medium when first tested but later reverted back to normal. These results are compared with those reported for various fungi and certain tentative conclusions made regarding gene mutations. (auth)

1717

BETA IRRADIATION EFFECTS ON RETICULO-ENDOTHELIAL SYSTEM FOLLOWING INTRAVENOUS INJECTION OF RADIOACTIVE CHROMIUM PHOSPHATE. Elemer R. Gabrieli and John L. Cutler (Yale Univ. School of Medicine, New Haven, Conn.). Proc. Soc. Exptl. Biol. Med. 87, 661-5(1954) Dec.

Colloidal chromium phosphate suspensions containing graded amountso f P^{32} were injected intravenously into rats, thus exposing the reticulo-endothelial cells which phagocytized the radioactive colloidal matter to intensive beta radiation. The radioactivity contents of livers were determined in rats sacrificed at different intervals from 1 hour to 10 days after chromium phosphate injection. The amount of radioactivity in the liver remained unchanged during observation period when chromium phosphate injection contained only 0.05 μc of P^{32}. Considerable increase in radioactivity of the liver due to redistribution within the body was observed following the 0.29 μc dose, and still greater accumulation of radioactivity obtained following 0.39 μc. When, however, 17.91 μc were injected, the liver ceased to accumulate radioactive particles. Rats were injected with radioactive chromium phosphate a day before parabiotic pairing with untreated rats; 4 days later radioactivity was found in the livers of the uninjected partners. The portion of the injected amount which was transferred increased with greater P^{32} content of the chromium phosphate. Radioautographic studies of liver showed changes similar to those following whole body x irradiation, i.e., distortion of the peripheral lobular pattern and large "sunbursts." The observed changes are interpreted as indicating great radiosensitivity of the RE system. It is suggested that destruction of this system by injection of isotopes with a shorter range of radiation than P^{32} could be achieved. (auth)

1718

CHANGES IN NUCLEIC ACIDS OF CELLS OF MOUSE MAMMARY CARCINOMA FOLLOWING EXPOSURE TO X-RAY OF LOW DOSAGE. Maud L. Menten, E. T. Feldsted, and M. Willms (British Columbia Medical Research Inst. and the Vancouver General Hospital, Canada). Expil. Cell Research 7, 83-94(1954) Aug.

X radiation of 150 roentgens caused a continuous decrease in the nucleic acid content of cells of a mouse mammary carcinoma uniformly suspended in Ringer's solution. A dosage of 100 r produced a variable increase in cellular nucleic acids, which appeared to be correlated with high RNAP/DNAP ratios. We believe that this dosage caused some increased susceptibility of DNA to alkaline hydrolysis, as shown by the Schmidt-Thannhauser technic, resulting in an abnormal increase in RNAP from 30 to 90 minutes after exposure. A dosage of 75 r produced changes in cellular nucleic acid difficult to interpret. The increase in nucleic acids following x radiation of 100 r was interpreted as a synthesis from precursors existing in the cell rather than a recovery from a temporary inhibition in their development. (auth)

1719

RADIATION BIOLOGY. VOLUME I. HIGH ENERGY RADIATION. Alexander Hollaender, Ed. New York, McGraw-Hill Book Co., Inc., 1954. 1265p.

The principles of radiological physics are reviewed, and various phases of the biological effects of ionizing radiations are discussed by authorities in each field. Each chapter is supplemented by an extensive bibliography, and subject and author indexes are included. (C.H.)

RADIATION HAZARDS AND PROTECTION

1720

Naval Medical Research Inst., Bethesda

THE PROTECTIVE EFFECT OF GRANULOCYTES IN RADIATION INJURY. (LECTURE AND REVIEW SERIES 54–4). E[ugene] P. Cronkite, Naval Medical Research Inst., Bethesda and George Brecher, National Inst. of Arthritis and Metabolic Diseases, National Institutes of Health. Oct. 7, 1954. 21p. (NP-5472)

1721

EFFECTS OF SOMATOTROPIC HORMONE (STH) AND SALINE ON MICE EXPOSED TO TOTAL-BODY IRRADIATION. Mitchell W. Spellman, Franklin E. Roth, Leo Blank, and C. Walton Lillehei (Univ. of Minnesota Medical School, Minneapolis). Cancer 8, 172–8(1955) Jan.–Feb.

Utilizing 20-g mice exposed to total-body irradiation (550 r) as the baseline for comparison, it appears from these studies that irradiated mice have a diminished tolerance to the daily subcutaneous injection of 0.2 or 0.5 cc saline as reflected by the more rapid rate at which irradiated saline controls succumbed in contrast to untreated irradiated controls. However, the elevated thirty-day postradiation mortality among both saline control groups was not significantly greater than that observed among the untreated controls. The daily subcutaneous administration of pituitary growth hormone (STH) in small dosage effectively neutralized the increased mortality observed in irradiated mice receiving either 0.5 or 0.2 cc saline per day. Larger amounts of STH were ineffective in this regard and actually enhanced the thirty-day postradiation mortality. Moreover, the subcutaneous administration of STH in small dosages in either 0.5 or 0.2 cc saline per day as pretreatment for two weeks prior to the exposure to total-body irradiation further decreased the thirty-day postradiation mortality to levels significantly lower than that observed in either the saline-treated irradiated controls or the untreated irradiated controls. Again, larger doses of STH were ineffective. The increased resistance to radiation injury attributed to pretreatment with small doses of STH is not reflected by greater weight increases or smaller weight losses among the treated animals. On the assumption that the observed beneficial effects of small doses of STH upon postradiation mortality in mice are based upon its anabolic properties, a mechanism is suggested whereby the consequent diminished tissue destruction and nitrogen excretion facilitate conservation of vital electrolytes. (auth)

1722

PERSONNEL PROTECTION IN ATOMIC INDUSTRY. W. D. Norwood (Hanford Atomic Products Operation, Richland, Wash.). Arch. Ind. Health 11, 42–6(1955) Jan.

Methods used to protect and maintain employee health at the Hanford atomic project are outlined briefly. The program of radiation protection is discussed. (C.H.)

RADIOTHERAPY

1723

Radiological Lab., Univ. of Calif., San Francisco. School of Medicine

SEMIANNUAL REPORT FOR PERIOD ENDING DECEMBER 31, 1954. Jan. 1955. 27p. Contract AT-11-1-GEN-10. (UCSF-10)

Physics. Modifications in the 70-Mev synchrotron to insure reproducible and essentially continuous operation are reported. Biology. A critical evaluation was continued of tests for the determination of the relative biological effectiveness of various kinds of ionizing radiation. Data are presented from studies of the effect of cell concentration and oxygen tension on the sensitivity of selected microorganisms to x rays; reaction of the mouse spleen to x rays measured by changes in organ weight; and the late effects of radioiodine treatment on patients. (For preceding period see UCSF-9.) (C.H.)

1724

PHYSICAL ASPECTS OF BETATRON THERAPY. John S. Laughlin (Cornell Univ. of Medical Coll. and Memorial Center for Cancer and Allied Diseases, New York). Springfield, Illinois, Charles C. Thomas, 1954. 99p.

The physical, therapeutic, and biological aspects of high-energy x rays and high-energy electron beams are discussed. Most of the data discussed were taken with betatrons. (C.H.)

1725

THE DISTRIBUTION OF INTERSTITIAL AND INTRACAVITARY INJECTIONS OF CERTAIN RADIO-CHEMICAL PREPARATIONS OF MEDICAL INTEREST. Granvin C. Kyker (Oak Ridge Inst. of Nuclear Studies, Tenn.). Bol. assoc. med. Puerto Rico 46, 362–74(1954) Aug. (In English)

The relation of distribution to the effective internal of radiochemicals is presented. Immobilization of a dose at the site of injection and efficient removal of a dose from the body comprise the extreme objectives for therapeutic usefulness of radiochemical preparations. Artificially produced radioisotopes that have potential medical application are cited. The more important factors that influence the pattern of distribution of a radiochemical in the body are discussed. The factors include the colloidal state, radiocolloidal properties at very low concentrations, the size of the chemical dose, and combination with chelating agents. The principles and influencing factors are illustrated by current studies of colloidal chromic phosphate and ionic solutions of lutecium, yttrium, and holmium. (auth)

1726

PHYSICAL ASPECTS OF ROTATING TELECOBALT EQUIPMENT. C. B. Braestrup and R. T. Mooney (Francis Delafield Hospital, New York). Radiology 64, 17–28(1955) Jan.

Results are reported from a study of dose distribution and protection requirements of a rotating cobalt teletherapy unit. (C.H.)

1727

THREE-DIMENSIONAL BODY FORMS FOR USE IN TREATMENT PLANNING WITH THE 23-MEV BETATRON. L. L. Haas, R. C. Wakerlin, and V. P. Destro (Univ. of Illinois Coll. of Medicine, Chicago). Radiology 64, 105–11(1955) Jan.

Various techniques have been described for preparation of rigid masks and body forms for use in treatment planning with the 23-Mev betatron in its experimental stages. Certain techniques were discarded for reasons outlined. Direct molding of Gypsona or similar plaster bandages on the patient proved to be the simplest procedure for delineation of body perimeters and for preparation of head and other body masks. These forms are shown to be useful for treatment planning and also for replacement on the patient's body for localization and identification of the selected fields. (auth)

TOXICOLOGY STUDIES

1728

Atomic Energy Project, Univ. of Rochester

A RADON EXPOSURE UNIT FOR SMALL ANIMALS. Donald A. Morken. Dec. 6, 1954. 35p. Contract W-7401-eng-49. (UR-307)

A respiration apparatus has been designed and constructed in which small animals may be exposed to an atmosphere of radon which is essentially free of the decay products of radon. A high degree of control over the radon atmosphere is possible. Ten milligrams of radium in solution supply a maximum concentration of radon of $2.7 \cdot 10^{-4}$ c/l. Exposure duration is limited only by the frequency at which food and water must be replenished and the animal cage cleaned. (auth)

1729

THE SENSITIVITY OF DEVELOPING HABROBRACON TO OXYGEN. A. M. Clark and E. B. Herr, Jr. (Marine Biological Lab., Woods Hole, Mass., Brookhaven National Lab., Upton, N.Y., and Univ. of Delaware, Newark). Biol. Bull. 107, 329-34(1954) Dec.

Groups of Habrobracon were exposed during post-embryonic development to air, nitrogen, oxygen and carbon dioxide and studied with regard to development and oxygen uptake. Deleterious effects from oxygen and from carbon dioxide were observed after exposure at the white pupal stage, but not after exposure at the larva-in-cocoon stage. No deleterious effects from exposure to nitrogen were found. Exposure of white pupae to one atmosphere of oxygen or carbon dioxide caused cessation of development at the pigmented pupal stage in a high proportion of the individuals. The incidence of emergence from cocoons as adults was higher for males than for females. Adults with wing and antennal abnormalities occurred. Exposure to two atmospheres of oxygen or carbon dioxide resulted in greater deleterious effects on development than did exposure to one atmosphere. The oxygen uptake of unpigmented pupae exposed to two atmospheres of oxygen is markedly reduced. No such reduction was observed following treatment with two atmospheres of nitrogen or carbon dioxide or one atmosphere of oxygen. (auth)

1730

INVESTIGATIONS ON METABOLISM OF FLUORIDE. III. EFFECT OF ACUTE RENAL TUBULAR INJURY ON URINARY EXCRETION OF FLUORIDE BY THE RABBIT. Frank A. Smith, Dwight E. Gardner, and Harold C. Hodge (Univ. of Rochester School of Medicine and Dentistry, N. Y.). Arch. Ind. Health 11, 2-10(1955) Jan.

Acute renal tubular injury was produced in rabbits by the subcutaneous administration of uranyl nitrate hexahydrate. Development of the acute uranium nephritis and recovery therefrom were followed by measuring urinary protein and chloride concentrations by determining urine volumes, and by renal histological examinations. The uranium-poisoned rabbit that has sustained an acute, high-grade tubular injury maintained a normal fluoride balance, i.e., neither retained nor excreted abnormal proportions of ingested fluoride. The calculated resorption of fluoride in the renal tubule was much less than that of chloride. The fluoride content in soft tissues, viz., blood, thyroid, heart, pancreas, liver, and kidneys, is normally low and is increased very little by doubling the fluoride intake; uranium injury to the kidney did not alter this tendency. Calculations based on the balance data are presented to show that the retained fluoride is deposited in the skeleton of the animal. (auth)

1731

RELATION OF PARTICLE SIZE OF U_3O_8 DUST TO TOXICITY FOLLOWING INHALATION BY ANIMALS. Herbert B. Wilson and George E. Sylvester (Univ. of Rochester School of Medicine, N. Y.), Sidney Laskin (Institute of Industrial Medicine, New York), Charles W. La Belle (Jefferson Medical Coll., Philadelphia, Penna.), James K. Scott (Univ. of Rochester Atomic Energy Project, N. Y.), and H. E. Stokinger (Occupational Health Program, Cincinnati, Ohio). Arch. Ind. Health 11, 11-16(1955) Jan.

U_3O_8 dust at a concentration of approximately 80 mg per cubic meter with a mass-median particle diameter of 0.5 μ has been shown to be much more toxic than the same concentration with an average mass-median diameter of 2.5 μ. This was evidenced in the rabbit by higher mean urinary protein values, by retardation of growth, and by significantly greater renal damage, as shown by histopathological examination of tissues; in the rat it was evidenced by retardation of growth, by renal damage shown histopathologically, and in serially killed rats by gross lung damage and increase in lung weight and by gross, probably secondary, weight abnormalities in other organs. In all tissues analyzed deposition of uranium was greater following inhalation of particles of 0.5 μ MMD. The lungs showed the greatest differences. The results of this study have been compared with those of a corresponding UO_2 study. The quantitative toxic differences related to particle size were very much alike, whether the oxide was UO_2 or U_3O_8, and, when adjusted for the difference in exposure hours, the amounts of uranium in the tissues of terminally killed animals were nearly identical. Some qualitative differences between the results of the UO_2 and U_3O_8 0.5 μ MMD studies have been noted. (auth)

TRACER APPLICATIONS

1732

PERMEABILITY OF NORMAL AND ARTIFICIALLY CONSTRUCTED CANINE URINARY BLADDERS TO I^{131}, Na^{22}, AND P^{32}. Horace D. Marucci, William C. Shoemaker, Arthur W. Wase, Herbert D. Strauss, and Samuel V. Geyer (Hahnemann Medical College and Hospital of Philadelphia, Penna.). Proc. Soc. Exptl. Biol. Med. 87, 569-71(1954) Dec.

A method for determining ion transportation through the mucosa of the urinary bladder is described. This method has been used on normal and artificially constructed bladders in dogs. Rapid and continuous absorption of iodide, sodium, and phosphorus ions takes place through the mucous membrane lined bladders, while only minimal amounts of these ions are absorbed through the normal bladder and through bladders constructed by means of seromuscular grafts. (auth)

1733

THE ROLE OF DIRECT AND EXPLANT-TRANSPLANTS OF THE ANTERIOR PITUITARY IN THE UPTAKE OF I^{131} BY THE THYROID GLAND OF HYPOPHYSECTOMIZED RATS. Petar N. Martinovitch and Vlado L. Vidović. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 3, 131-7(1953) Aug.

1734

QUANTITATIVE β-TRACK AUTORADIOGRAPHY OF SINGLE CELLS. Hilde Levi (Univ. of Copenhagen,

Denmark). Exptl. Cell Research 7, 44-51(1954) Aug.

A method of high resolution beta track autoradiography applicable to single cells is described. The cells are suspended in liquid G-5 emulsion of Ilford and low energy beta tracks from C^{14} and S^{35} are registered quantitatively. (auth)

1735

POTASSIUM TRANSPORT IN HUMAN ERYTHROCYTES: EVIDENCE FOR A THREE COMPARTMENT SYSTEM. A. K. Solomon and G. Lennard Gold (Harvard Medical School, Boston, Mass.). J. Gen. Physiol. 38, 371-88(1955) Jan.

1736

THE TRANSPORT OF SODIUM INTO HUMAN ERYTHROCYTES IN VIVO. G. Lennard Gold and A. K. Solomon (Harvard Medical School, Boston, Mass.). J. Gen. Physiol. 38, 389-404(1955) Jan.

1737

USE OF I-131 CAPSULES IN THYROID-UPTAKE STUDIES. D. L. Tabern and Robert H. Storey (Abbott Labs., North Chicago, Ill.). Nucleonics 13, No. 1, 58-61(1955) Jan.

Availability of I^{131} to clinics and properly qualified physicians has made simplification of diagnostic techniques very desirable. The use of I^{131} has been simplified by adsorbing tiny amounts of completely reduced iodide activity on the interior walls of gelatin capsules. The activity of the capsules usually varies less than $\pm 2\%$. Several phantoms have been developed that permit quantitative comparison of the relative "point" source of the capsule with the much larger area of the thyroid or urine sample. A plastic cube phantom has been found to be satisfactory and is described. Comparisons were made of counting tubes used in phantom measurements. A Tracerlab G-M tube was found to be satisfactory with most of the phantoms studied. (M.P.G.)

CHEMISTRY

1738

Pennsylvania State Univ.

THE PENN STATE BIBLIOGRAPHY ON SPRAYS. Second Edition. Published by The Texas Co., New York. Dec. 1953. 214p. Contract DA-18-064-CML-1402, Final Technical Report, Bibliographical Appendix. (AD-30810)

1739

Los Alamos Scientific Lab.

CHELATING AGENTS AND STABILITY CONSTANTS. Harry [L.] Foreman. June 1954. 27p. Contract W-7405-eng-36. (LA-1851)

A . w basic concepts of the chemistry of chelates are presented, followed by a discussion of biological applications of chelates with special emphasis on the use of chelates for removing heavy metals from the body. Two cases in which Ca EDTA was used to hasten the excretion of plutonium from the body are presented. (auth)

1740

Los Alamos Scientific Lab.

THE PREPARATION OF METHYL BERYLLIUM HYDRIDE. Sherman W. Rabideau, Helen D. Cowan, Joe Fred Lemons, and Charles E. Holley, Jr. Nov. 1954. 6p. Contract W-7405-eng-36. (LA-1855)

In a study of the reaction between lithium aluminum hydride and an excess of dimethylberyllium, it was found that the beryllium hydride etherate which first forms is capable of reacting further with the dimethylberyllium to give the compound methyl beryllium hydride. The methyl beryllium hydride forms rather stable etherates. A glassy solid results from the removal of ether from the syrupy ether solution of this compound. The powdered solid is white and appears to have a crystalline structure; however, no pattern was obtained from an x-ray examination of the crystals. Microscopic examination showed the presence of either isotropic or amorphous crystals with a variable index of refraction between the limits 1.516 and 1.522. The density of the 63.5% beryllium methyl hydride was found to be 0.83 ± 0.01 g./ml by the flotation method. However, assuming that the densities are additive and using a density of 0.7 for diethyl ether, 0.7 for beryllium hydride, and 0.8 for lithium hydride, a value of 0.9 has been calculated for the density of pure methyl beryllium hydride. The pyrolysis of methyl beryllium hydride appears to follow a stepwise course: $2BeMeH \xrightarrow{\Delta} BeH_2 + Me_2Be$; $BeH_2 \xrightarrow{\Delta} Be + H_2$. (auth)

1741

Illinois Inst. of Tech.

INVESTIGATION OF METHODS FOR THE PREPARATION OF BORON COMPOUNDS. FINAL REPORT. (PARTS 2, 3, AND 4). Martin Kilpatrick, A[rthur] G. Keenan, M[ervin] E. Runner, Sei Sujishi, Mary Kilpatrick, and J. N. Keith. June 1954. 98p. [For Olin Mathieson Chemical Corp. Contract NOa(s)-52-1023c]. (MCC-1023-TR-79)

Exploratory work was undertaken to determine the suitability of various solvents as reaction media for electrolytic preparation of borohydride salts. The determination was made on the basis of the solvents non proton donating behavior, lack of reactivity with borohydride salts and NaH, ability to dissolve salts which form conducting solutions, and melting point range of 0 to 150°C. Conductometric studies of solutions of HCl and BCl_3 in non aqueous solvents were carried out under anhydrous conditions at ambient temperatures to obtain information concerning interactions and conduction phenomena in such solutions so as to develop a system of maximum conductivity without introducing polar constituents which would destroy BCl_3 or any boron hydride produced by electrolysis. (J.E.D.)

1742

Utah Univ.

THERMODYNAMIC PROPERTIES FOR SOME BORON COMPOUNDS. Douglas H. Pack, John R. Morrey, George Richard Hill, Qwentin G. Klingler, and Franklin S. Harris, Jr. Sept. 1954. 33p. [For Olin Mathieson Chemical Corp. Contract NOa(s)-52-1023c]. (MCC-1023-TR-82)

The "best" values for thermochemical, and thermodynamic properties have been selected from the literature and other available sources and used in the calculation and compilation of tables of thermodynamic properties of several boron compounds at selected temperatures. The presently available theoretical thermodynamic data for some of the gaseous boranes have been found to be inconsistent with the corresponding experimental data for the lower-energy phases of these compounds. The data on heats of formation of diborane, boric oxide, boric acid, and boron trichloride, now form a consistent set of values and thus form a solid foundation for the thermochemistry of boron compounds. It is concluded that the tables of thermodynamic functions as presented here now reflect

reasonable values with the exception that the values for the gaseous boranes are inconsistent with the data for their lower-energy phases. (auth)

1743

Aluminum Research Labs., Aluminum Co. of America
EXPLOSIONS OF ALUMINUM AND WATER. REPORT NO. 2-50-33. G[eorge] Long, P. T. Stroup, and W. T. Ennor. Aug. 1, 1950. 47p. (NP-5471)

An explosion which occurs when molten Al is spilled into water during ingot casting was examined. It was found that such explosions were not easily obtained in experimental tests but required reproduction of rather critical conditions and limits. However, under the proper conditions violent explosions were obtained. The results showed that similar explosions could be produced in steel or concrete containers; and that their occurrence was affected by depth of water, temperature of water, temperature of metal, height of drop of metal, and size of metal stream. One of the most important factors was found to be the surface condition of the bottom of the water container. The presence of grease, oil or paint coatings of certain kinds prevented explosions; while the presence of lime, gypsum, and other hydrated compounds in the coating increased the likelihood of explosions. An iron grid used to break up the metal stream prevented explosions. Molten magnesium was found to behave in a manner similar to aluminum in producing explosions which were also prevented by grease and paint coatings. (auth)

1744

Pennsylvania State Univ. Coll. of Mineral Industries
AN INVESTIGATION OF THE ACTIVITY OF CALCIUM CARBONATE IN MIXTURES OF FUSED SALTS. Tormod Forland. Sept. 1954. 20p. Contract N6 onr 269, T. O. 8, Technical Report No. 57. (NP-5494)

The energy of mixing, activity, and activity coefficients of $CaCO_3$ in mixtures of fused salts were obtained. The free energy of fission was plotted as a function of temperature, from which the heat of fission and melting point were found. The experiments indicate that the entropy of mixing for a simple ionic mixture is given by a random distribution of ions of the same sign regardless of their numbers of charges. The energy of the mixed system may with a good approximation be expressed as a sum of energies characteristic for each pair consisting of a cation and another cation in the second coordination sphere, taking into account that the number of these neighbors may change with the composition of the mixture. Finally, structural differences for the components of a mixture may in some cases play a role. (J.E.D.)

1745

Culcheth Labs., Research and Development Branch, Industrial Group, United Kingdom Atomic Energy Authority (England)
THE CHLORINATION OF NIOBIUM ORES AND OXIDES. R. Lind and T. A. Ingles. Dec. 23, 1954. 11p. (RDB(C)/TN-106)

The product of the chlorination of niobium pentoxide in the presence of carbon between 320 and 1000°C was always a mixture of niobium oxychloride and niobium pentachloride. Passage of the mixture through a porous carbon plug at 500°C in the presence of chlorine converted the oxychloride to pentachloride. The chlorination of niobite ore was investigated, and conditions determined for the volatilization of more than 99% of the niobium from the ore. (auth)

1746

Tennessee Valley Authority, Wilson Dam, Ala.
UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL. PROGRESS REPORT [FOR] JANUARY 1955. Jan. 28, 1955. 7p. (RMO-2732)

(For preceding period see RMO-2731.)

1747

A STUDY OF THE EXPLOSIVE PROPERTIES OF POLYVINYL NITRATES. Albert Le Roux and Robert Sartorius. Translated from Mem. poudres, 34, 167-77(1952). 10p. Available from Associated Technical Services (Trans. No. 76F4F), East Orange, N. J. (AEC-tr-2059)

The results of experiments carried out with samples of polyvinyl nitrate with respect to their explosive properties and to determine the possibility of their use as explosives are given. With explosive properties which on the whole are quite comparable to those of nitrocelluloses or nitrated starch, the polyvinyl nitrates present some restrictions in use which in conjunction with their high price, at the present time, limit the possibility of practical application in the explosives industry. (auth)

1748

THE RELATION BETWEEN VISCOSITY AND ELECTRICAL CONDUCTIVITY OF SALT SOLUTIONS. (K Voprosu O Sviazi Mezhdu Viazkost'iu I Elektroprovodnost'iu V Rastvorakh Solei). D. A. Pospekhov. Translated by G[regory] Belkov from Zhur. Fiz. Khim. 22, 59-68(1948). 18p. (TT-300; AEC-tr-1289)

The relation between viscosity, η, and molecular conductivity, Λ, follows Johnston's equation ($\Lambda^n\eta$ = const.) above a specific concentration in benzene, toluene, and nitrobenzene solutions of $AlBr_3$-$SbBr_3$, toluene solutions of $CuBrAl_2Br_6$, and ethyl bromide solutions of $AlBr_3$. The relation is not valid for ethyl bromide solutions of $SbBr_3$-$AlBr_3$. An inverse proportion between conductivity and viscosity is observed in aqueous solutions of $AgNO_3$ and in nitrobenzene solutions of $SbBr_3$-$AlBr_3$. (M.P.G.)

1749

MAGNETIC MOMENTS OF SOME OCTAHEDRAL COMPLEXES OF IRIDIUM. Eric N. Sloth and Clifford S. Garner (Univ. of California, Los Angeles). J. Chem. Phys. 22, 2064-6(1954) Dec.

Magnetic susceptibilities of Na_2IrCl_6, Na_3IrCl_6, $2H_2O$, and $(NH_4)_2Ir(H_2O)Cl_5$ were determined for these solids and for aqueous solutions 0.6f in the complex compound and 1f in HCl by the Gouy method. Na_2IrCl_6 is paramagnetic in the solid state and in solution, with a magnetic moment corresponding to one unpaired 5d electron and to d^2sp^3 covalent Ir-Cl bonds. The two iridium (III) complexes are diamagnetic, corresponding likewise to d^2sp^3 bond formation. (auth)

1750

STUDIES ON ION-EXCHANGE RESINS. XII. SWELLING IN MIXED SOLVENTS. Harry P. Gregor, Deana Nobel, and Melvin H. Gottlieb (Polytechnic Inst. of Brooklyn, N. Y.). J. Phys. Chem. 59, 10-13(1955) Jan.

The swelling of a polystyrene-sulfonic acid resin in the ammonium, quaternary ammonium and silver states in mixtures of water and methanol, ethanol, isopropyl alcohol, and dioxane was studied. Total solvent uptake and distribution between resin and solution phases were determined. The more polar solvent (water) was sorbed preferentially, the degree of preference being greatest at low water contents. The cationic state of the resin influenced the selective sorp-

tion of solvent to a marked degree. Swelling appears to be determined largely by the dielectric constant of the sorbed solutions; this behavior is similar to that predicted by Bjerrum's theory of ion-pair formation. Similar studies were carried out with a quaternary base anion exchanger in in the chloride and acetate states in ethanol-water mixtures. (auth)

1751

TOTAL PRESSURE OVER CERTAIN BINARY LIQUID MIXTURES. Joseph A. Neff and James B. Hickman (West Virginia Univ., Morgantown). J. Phys. Chem. 59, 42-5 (1955) Jan.

Measurements of total pressure over binary liquid mixtures of perfluoroheptane with heptane and 3-methylheptane, titanium (IV) chloride with heptane, and tetrachloromethane with 3-methylheptane at two or more temperatures in the range 25 to 80° are reported. The data substantiate the conclusion that the solubility behavior of the nonregular solutions of hydrocarbons in other nonpolar liquids is adequately represented by the Hildebrand equations, using an empirical solubility parameter for the hydrocarbon. The Hildebrand equations are used as a means of reducing the total pressure measurements to more usable form. (auth)

1752

STUDIES ON COORDINATION COMPOUNDS. XIII. FORMATION CONSTANTS OF BIVALENT METAL IONS WITH THE ACETYLACETONATE ION. Reed M. Izatt, W. Conard Fernelius, and B. P. Block (Pennsylvania State Univ., State College). J. Phys. Chem. 59, 80-4(1955) Jan.

Thermodynamic, stepwise equilibrium formation constants are given for the reaction in aqueous solution of the acetylacetonate ion with Mg^{2+}, Cd^{2+}, Mn^{2+}, Fe^{2+}, Co^{2+}, UO_2^{2+} and Cu^{2+}. An overall molarity quotient is given for the reaction of Hg^{2+} with the acetylacetonate ion in a solution with ionic strength 0.50. Plots of $\frac{1}{2}$ (log K_{f_1} + log K_{f_2}) for all the above ions (except UO_2^{2+}) vs electronegativity of the metal ion, or second ionization potential of the gaseous atom, show a linear relationship with two very notable exceptions, Hg^{2+} and Be^{2+}, which form more stable complexes in each case than would be expected from their electronegativity or second ionization potential values. The following order of stability was observed for the elements of Group II with acetylacetone: Mg < Cd < Zn < Be < Hg. (auth)

1753

ION-EXCHANGE MEMBRANES. I. MEMBRANE POTENTIALS. W. F. Graydon and R. J. Stewart (Univ. of Toronto, Canada). J. Phys. Chem. 59, 86-9(1955) Jan.

A method of preparing homogenous ion-exchange membranes of the polystyrenesulfonic acid type is described. Measurements are reported which show that these membranes may be prepared with high tensile strength and low electrical resistance. The membrane potentials characteristic of these membranes are good approximations to the ideal membrane potentials for cation transfer only. Deviations from the ideal membrane potential are discussed. It is concluded that water transfer is in many cases the major cause of these deviations. Approximate water transference numbers for various membranes are estimated. (auth)

1754

TORSIONAL BARRIERS IN MOLECULES $C_2H_mF_nCl_{6-m-n}$. N. W. Luft (Ladybridge Road, Cheadle Hulme, Cheshire, England). J. Phys. Chem. 59, 92-3(1955) Jan.

A revision of some reported information on threefold barrier heights and torsional frequencies of halogenated ethanes of the general composition $C_2H_mF_nCl_{6-m-n}$ is presented. Inconsistencies in the torsional assignments, which lead to discrepancies with the additive rule (Faraday Soc. Discs. 10, 117(1951); J. Chem. Phys. 21, 179(1953)) for the increments, of threefold torsional barriers for ethane derivatives are discussed. Data for threefold torsional barriers of fluorinated and chlorinated ethanes are tabulated. (J.A.G.)

1755

MOLECULAR REARRANGEMENTS. III. THE MECHANISM OF THE WAGNER-MEERWEIN REARRANGEMENT IN THE 1,2,2-TRIPHENYLETHYL SYSTEM. Clair J. Collins and William A. Bonner (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 92-9(1955) Jan. 5. (cf. NSA 8-508, 509)

Several reactions of phenyl-labeled 1,2,2-triphenylethanol (IIc), its acetate (IIIc) and its tosylate (IVc) have been carried out under identical reaction conditions used for the chain-labeled analogs, and the radiochemical consequences of these reactions in both systems of labeling have been compared. It has been shown by this novel double labeling technique that the reactions studied fall into two categories: (1) those in which a statistical redistribution of radioactivity has been achieved and (2) those in which a statistical redistribution has been approached, but not achieved. A simple kinetic relationship has been derived for the latter class of reactions, which allows a calculation of the radiochemical redistributions for various reactions in one series, knowing the results of the other. These calculated values agree with the observed values within experimental error, allowing the data to be rationalized quantitatively in terms of a mechanism involving open carbonium ion intermediates in which the cations undergo partial or complete radiochemical equilibration, depending upon their lifetimes. There is no evidence for bridged ionic intermediates in the reactions studied. (auth)

1756

MOLECULAR REARRANGEMENTS. IV. TRIPLE-LABELING EXPERIMENTS ON THE ISOTOPE POSITION ISOMERIZATION OF 1,2,2-TRIPHENYLETHYL ACETATE. William A. Bonner and Clair J. Collins (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 99-103(1955) Jan. 5. (cf. NSA 8-508, 509)

1,2,2-Triphenylethyl acetate, separately labeled in the chain, phenyl and acetate portions of the molecule, has been studied kinetically with respect to the rates of radiochemical isomerization and of acetoxyl exchange under the influence of an acid catalyst. Confirmatory experiments, using combinations of these three differently labeled species, have also been carried out. It is found that the rates of radiochemical equilibration of the ring-labeled and chain-labeled acetates are equal, and each is identical to the rate of loss of the labeled acetoxyl group. The data are explainable in terms of open carbonium ion intermediates in which the cation undergoes radiochemical isomerization prior to product formation. It is shown that, as expected, no internal return accompanies the isomerization. (auth)

1757

PREPARATION OF ACTINIUM METAL. Joseph G. Stites, Jr., Murrell L. Salutsky, and Bob D. Stone (Mound Lab., Miamisburg, Ohio). J. Am. Chem. Soc. 77, 237-40(1955) Jan. 5.

Quantities of actinium sufficient to permit preparation of the metal have not been available heretofore. Actinium metal has been prepared on the milligram scale by reduction of actinium fluoride with lithium vapor. A high-purity product was obtained with a yield of 95%. It resembles lanthanum metal both chemically and physically. The melting point of actinium metal was found to be 1050 ± 50°. The melting point of actinium metal shows both a horizontal and vertical relationship to the melting points of metals adjacent to it in the periodic table. It lies between that of radium and thorium and is about 200° higher than the melting point of lanthanum. (auth)

1758

DEPENDENCE OF γ−AND PHOTOLUMINESCENCE YIELD OF KI-Tl CRYSTALS ON THE CONCENTRATION OF THALLIUM. L. M. Belyaev, M. D. Galanin, Z. L. Morgenshtern, and Z. A. Chizhikova (Lebedev Physics Inst. and Inst. of Crystallography, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 99, 691-4(1954) Dec. 11. (In Russian)

ANALYTICAL PROCEDURES

1759

Ames Lab.

ANALYSIS OF THORIUM−ALUMINUM ALLOYS. R. E. Edwards and C[harles] V. Banks. Sept. 9, 1953. 19p. Contract W-7405-eng-82. (ISC-405)

A method is presented for the separation of thorium from aluminum by the homogeneous precipitation of thorium oxalate with dimethyl oxalate. A method is presented for the extraction of thorium nitrate into mesityl oxide from a solution saturated with lithium nitrate. This method is rapid, accurate and suffers from few interferences. A method is presented for the spectrophotometric titration of ethylenediamine tetraacetic acid with thorium using Chrome Azurol S indicator. This method, used in conjunction with the extraction of thorium, is a rapid and accurate means of concluding the determination of thorium. (auth)

1760

Ames Lab.

ISOTOPIC ASSAY OF LITHIUM BY MEANS OF HYDRIDE BAND EMISSION SPECTRA. Velmer A. Fassell and Henry J. Hettel. [Dec. 20, 1954]. 9p. Contract [W-7405-eng-82]. (ISC-554)

A spectrographic method applicable to the determination of the Li^6 Li^7 isotopic ratio is described. The procedure involves the low current d−c arc excitation of lithium sulfate samples in an atmosphere of 50% H2 − 50% He. The intensity ratio of selected Li^6H and Li^7H band lines is plotted against the concentration ratio to yield linear analytical curves of unit slope. The concentration range 8% to 92% Li^6 can be covered by this procedure. The experimental error is about ± 5% of the actual concentration ratio. (auth)

1761

Los Alamos Scientific Lab.

FLUOROMETRIC DETERMINATION OF URANIUM IN SULFURIC ACID. Karl S. Bergstresser. July 1954. 22p. Contract W-7405-eng-36. (LA-1706)

A revision in the procedure for preparing sulfuric acid solutions of uranium samples and determining 0.1 to 25 μg of this element fluorometrically prevents difficulties which were previously encountered. Selection of required interference light filters is described. Precision of fluorometric determinations is indicated by a standard deviation of 3% for 16 samples, each containing 11.4 μg of uranium. (auth)

1762

Los Alamos Scientific Lab.

A RADIOCHEMICAL PROCEDURE FOR THORIUM AND ITS APPLICATION TO THE DETERMINATION OF IONIUM IN CORAL LIMESTONE. Herbert A. Potratz, J. W. Barnes, and E. J. Lang. Oct. 18, 1954. 19p. Contract W-7405-eng-36. (LA-1845)

Samples of coral limestone were analyzed for Th^{230} by a radiochemical procedure which involves carrier-free separation of the total thorium in the sample by use of thenoyltrifluoroacetone extraction, followed by pulse analysis of the alpha activity in the separated thorium. Th^{226} is used as tracer to determine the chemical yield. The Th^{230} content of the coral was found to vary with the depth in a fairly simple manner. Near the surface the coral contains less than 2×10^{-6} ppm of ionium. With increasing depth the ionium content increases, reaches a value of 4×10^{-5} ppm at about 100 ft, decreases sharply to about 2×10^{-5} ppm, then increases again, reaching a value of 4×10^{-5} ppm at 160 ft. The uranium content of the Elugelab coral also varies somewhat, but within much narrower limits −2.9 to 5.5 ppm. (auth)

1763

Pennsylvania Univ.

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS OF BORON COMPOUNDS. FINAL REPORT. John C. Clayton. Aug. 1954. 88p. [For Olin Mathieson Chemical Corp. Contract NOa(s)-52-1023c]. (MCC-1023-TR-66)

Investigation of possible instrumental methods of chemical analysis of B compounds is presented. A polarographic method was developed for the determination of small amounts of boric acid. Visible and ultraviolet spectra of B compounds were determined. Developments made in the field of high-frequency titrations are described. The feasibility of using internal electrodes in chemical oscillometry was investigated. (J.E.D.)

1764

Atomic Energy Project, Univ. of Calif., Los Angeles

THE DETERMINATION OF TRIOSE PHOSPHATE ISOMERASE. William S. Beck. Jan. 14, 1955. 15p. Contract AT-04-1-GEN-12. (UCLA-321)

The difference in rate of formation of the chromogenic 2,4-dinitrophenylosazone derivatives of glyceraldehyde-3 phosphate and dihydroxyacetone phosphate permits accurate measurement of the two triose phosphates in a mixture by means of carefully timed chromogen development reactions. This principle provides a convenient method for the assay of triose phosphate isomerase. The rate of conversion of glyceraldehyde-3-phosphate to dihydroxyacetone phosphate is measured by determination of the [glyceraldehyde-3-phosphate]/[dihydroxyacetone phosphate] ratio and total [alkali-labile phosphorus] in filtrates from which can be calculated glyceraldehyde-3-phosphate disappearance. (auth)

1765

FULLY AUTOMATIC EQUIPMENT FOR COLORIMETRIC ANALYSIS. (Vollautomatische Colorimetrische Analysengeräte). Hans Fuhrmann. Translated by Anne Sandel from Chem.-Ing.-Tech. 26, 401-4(1951). 10p. (AEC-tr-1993)

Several fully atuomatic discontinuous and continuous colorimetric analysis units are described. In addition to flow units for colored solutions, units for the continuous and intermittent analysis of colorless solutions and gases are described in which reagents are automatically added causing a discoloration corresponding to the concentration of the solution or the gas. The discoloration is then measured photoelectrically. (L.T.W.)

DEUTERIUM AND DEUTERIUM COMPOUNDS

1766

INFRARED SPECTRUM AND MOLECULAR CONSTANTS OF C_2D_2. Robert M. Talley and Alvin H. Nielsen (Univ. of Tennessee, Knoxville). J. Chem. Phys. 22, 2030-41(1954) Dec.

The infrared spectrum of C_2D_2 has been reinvestigated in the region 500 to 8000°K with a prism-grating spectrometer. Thirty-nine absorption bands were observed, of which twenty-six are new, and ten have been resolved into rotational fine structure. This brings the present total of observed bands to fifty one. Figures of the bands are shown, wave numbers of all observed lines are given in kaysers reduced to vacuum, and the absorption regions are described. All the bands observed have been given vibrational assignments, and a vibrational analysis has been made which yields the wave numbers of the harmonic frequencies and the values of the anharmonic constants. Rotational analyses of all the resolved bands have been made, and from these the rotational constants which agree with those obtained by Saksena have been determined. (auth)

FLUORINE AND FLUORINE COMPOUNDS

1767

Dow Corning Corp.
FLUORINE–CONTAINING POLYETHERS. BIMONTHLY REPORT NO. 4 [FOR] OCTOBER 12, 1954 TO DECEMBER 12, 1954. O. R. Pierce, D. D. Smith, and R. M. Murch. 27p. Contract AF33(616)-2417. (NP-5497)

A quantity of 3,3,4,4,5,5,5-heptafluoro-2-pentanol was prepared as a precursor to 3,3,4,4,5,5,5-heptafluoro-1-pentene. Additional quantities of 2-methyl-3,3,3-trifluoro-1,2-epoxypropane were prepared by an alternate procedure. Polymerization of both 3,3,3-trifluoro-1,2-epoxypropane and 2-methyl-3,3,3-trifluoro-1,2-epoxypropane were studied. A series of catalysts comprising $FeCl_3$, $AlCl_3$, SO_3, and BCl_3 were evaluated. In addition, a copolymer of these two monomers was prepared. Reaction of low molecular weight polymers with both maleic anhydride and hexamethylene diisocyanate was investigated. The latter appears to offer a means of chain-lengthening the polymer. The synthesis of a glycol formal was achieved by reaction of 2,2,3,3,4,4-hexafluoro-1,5-pentanediol with dibutyl formal. (auth)

1768

THE ACTIVITY OF SOLUTION COMPONENTS IN LIQUID HYDROGEN FLUORIDE. REPORT NO. 1. N. S. Nikolaev and I. V. Tananaev. Translated from Izvest. Sektora Fiz.-Khim. Anal. Akad. Nauk S.S.S.R. 20, 184-95(1950). 17p. THE ACTIVITY OF FLUORIDES OF THE ALKALI METALS IN LIQUID HYDROGEN FLUORIDE. REPORT NO. 2. N. S. Nikolaev. Ibid. 196-203. 12p. THE ACTIVITY OF HYDROGEN FLUORIDE IN SOLUTIONS OF AMMONIUM BASES. REPORT NO. 3. N. S. Nikolaev and I. V. Tananaev. Ibid. 204-11. 13p. (AEC-tr-1996)

1769

FORCE CONSTANTS FOR F_2CO AND THERMODYNAMIC PROPERTIES FOR F_2CO AND FClCO. R. J. Lovell, C. V. Stephenson, and E. A. Jones. (Vanderbilt Univ., Nashville, Tenn.). J. Chem. Phys. 22, 1953-5(1954) Dec.

A set of force constants for F_2CO has been calculated using the observed fundamental frequencies and a potential function consisting of valence force interaction terms and an additional term involving an interaction between the oxygen and fluorine atoms. The large values obtained for the interaction constant and the angle deformation constants were related to interaction forces between the terminal atoms. Also included are calculations of the thermodynamic properties of F_2CO and FClCO. (auth)

1770

VIBRATIONAL SPECTRA OF CF_2=CHD AND CF_2=CD_2. Walter F. Edgell and Casper J. Ultee (Purdue Univ., Lafayette, Ind.). J. Chem. Phys. 22, 1983-92(1954) Dec.

A method has been devised to prepare $CF_2 = CD_2$ and $CF_2 = CHD$. The infrared spectra of the gaseous compounds and the Raman spectra of the liquids have been determined. The observed frequencies have been assigned to the fundamental modes of vibration and to overtones and combinations. The torsional frequency has been estimated as ~ 720 and ~ 520 cm^{-1} in $CF_2 = CH_2$ and $CF_2 = CD_2$, respectively. The overtone of the torsional frequency interacts with the CH_2 or the CD_2 deformation fundamental and this is the cause of the anomalous results with the product rule. (auth)

1771

MICROWAVE SPECTRUM OF 1,1-DIFLUOROETHANE. N. Solimene and B. P. Dailey (Columbia Univ., New York). J. Chem. Phys. 22, 2042-4(1954) Dec.

The spectrum of 1,1-difluoroethane has been investigated over the region 18,000 to 38,000 Mc with a conventional Stark-modulation spectrometer. This molecule is a moderately asymmetric rotor of the oblate type with components of its dipole moment along the A and C axes. About 30 lines have been identified with the aid of the Stark effect and an approximate model for the molecule. The analysis yields the following rotational constants: A = 9491.95 Mc; B = 8962.65 Mc; C = 5170.43 Mc; κ = 0.75504. The barrier hindering internal rotation has been determined as $(1.25 \pm 0.20) \times 10^3$ cm^{-1} from intensity ratio measurements of the torsional frequency. (auth)

1772

HEAT OF FORMATION OF CF_3 AND SOME BOND DISSOCIATION ENERGIES FOR FLUOROCARBONS. B. S. Rabinovitch and J. F. Reed (Univ. of Washington, Seattle, and Loyola Univ., Chicago, Ill.). J. Chem. Phys. 22, 2092-3 (1954) Dec.

The reaction of Na atoms at 300°C with CH_3Cl, CH_2FCl, CHF_2Cl, and CF_3Cl was studied by the diffusion flame method. The rate data were corrected for subsequent reactions of the radicals produced, heat of formation of CF_3 and activation energies for Cl abstraction were computed. The bond dissociation energies of fluorocarbons are also given. (L.T.W.)

1773

J = 0 → 1 ROTATION TRANSITION OF TRIFLUOROIODOMETHANE. Fred Sterzer (New York Univ., New York). J. Chem. Phys. 22, 2094(1954) Dec.

The hyperfine splitting of the J = 0 → 1 transition of CF_3I at dry ice temperature, studied with a Stark modulated spectrometer, is reported. (L.T.W.)

1774

THE HEAT OF FORMATION OF TETRAFLUOROMETHANE. Ralph S. Jessup, Robert E. McCoskey, and Raymond A. Nelson (National Bureau of Standards, Washington, D. C.). J. Am. Chem. Soc. 77, 244-5(1955) Jan. 5.

The measurements of the heat of formation of CF_4 were made by burning weighed samples of CH_4 with F in a flame at constant pressure. A Cu reaction vessel immersed in the water of an electrically-calibrated colorimeter was used to measure the heat of reaction. (J.E.D.)

1775

HEAT OF FORMATION OF TETRAFLUOROMETHANE FROM COMBUSTION CALORIMETRY OF POLYTETRAFLUOROETHYLENE. D. W. Scott, and W. D. Good, and Guy Waddington (Bureau of Mines, Bartlesville, Okla.). J. Am. Chem. Soc. 77, 245-6(1955) Jan. 5.

1776

USE OF ION EXCHANGE RESINS FOR DETERMINATION OF ATMOSPHERIC FLUORIDES. J. P. Nielsen (Stanford Research Inst., Calif.) and A. D. Dangerfield (United States Steel Corp., Geneva, Utah). Arch. Ind. Health 11, 61-5 (1955) Jan.

A method is presented for the determination of atmospheric fluorides which involves the use of an anion exchange resin for the isolation of fluoride from interfering cations. The resin makes it possible to remove from large volumes of solution microgram quantities of fluoride ion, which can then be eluted with a relatively small volume of alkali. Distillation for the isolation of fluorides is eliminated, along with variable reagent and system blanks. Data are presented showing that results from the proposed procedure compare favorably with the accepted distillation procedure. (auth)

GRAPHITE

1777

RESONANCE ENERGY OF GRAPHITE. G. S. Colladay (U. S. Naval Ordnance Test Station, Inyokern, China Lake, Calif.). J. Chem. Phys. 22, 2085-6(1954) Dec.

A value of 11 kcal/g atom was obtained for the empirical resonance energy of graphite. Bond dissociation energies of 84.8 and 148 kcal/mole and force constants of 4.73×10^5 and 10.36×10^5 dynes/cm were obtained for C-C and C=C bonds. The overlap integral between nearest neighbor carbon atoms in the plane is evaluated. (L.T.W.)

1778

PARAMAGNETIC RESONANCE ABSORPTION IN GRAPHITE COMPOUNDS. B. Smaller, G. R. Hennig, and E. L. Yasaitis (Argonne National Lab., Lemont, Ill.). Phys. Rev. 97, 239(1955) Jan. 1.

Paramagnetic resonance absorption was observed in compounds of graphite with Li, Na, K, Ca, and Ba. (L.T.W.)

LABORATORIES AND EQUIPMENT

1779

Naval Medical Research Inst., Bethesda

A SPLASH TRAP. (MEMORANDUM REPORT NO. 54-9). G. W. Imirie. Oct. 12, 1954. 3p. (NP-5490)

The splash from radioactive and other boiling liquids can be effectively trapped by the use of the rugged, easily fabricated device described in this report. This device presents a solid barrier of glass to any outgoing splashes, but still permits the free passage of vapor through specifically oriented holes. The trap is fused to a T 24/40 joint for convenience of use. (auth)

MOLECULAR STRUCTURE

1780

THE SIZE OF INTERSTITIAL SOLUTE ATOMS IN CLOSE-PACKED METALS. Kenneth A. Moon (Ordnance Materials Research Office, Watertown, Mass.). J. Phys. Chem. 59, 71-6(1955) Jan.

An improved method was developed for calculating the size of octahedral solute atoms in primary close-packed metallic interstitial solutions from observed x-ray lattice expansion data. Values of the solute-metal bond length have been calculated by this method for the eight solutions for which x-ray data are available. Comparison of these values with bond lengths predicted by the method of Pauling shows that the solute atoms are bound to the lattice by slightly strained covalent bonds. The partial molar volume of the solute is in some cases much larger than would be expected from the degree of misfit alone. It was shown that such discrepancies can be attributed to the transfer of electrons from the lattice to the solute-metal bonds. (auth)

RADIATION CHEMISTRY

1781

Brookhaven National Lab.

PROGRESS REPORT ON FISSION PRODUCTS UTILIZATION. 7. STATUS REPORT ON THE GAMMA RAY INITIATED POLYMERIZATION OF N-VINYLPYRROLIDONE. D[avid] S. Ballantine and B[ernard] Manowitz. Oct. 1954. 7p. (BNL-317)

Gamma radiation from Co^{60} has been used to polymerize N—vinylpyrrolidone in an attempt to produce a polymer that might have use as a blood plasma expander of better quality than the commercial polymer. A study has been made of the effect of monomer concentration, temperature, gamma-ray intensity, and solvent composition on the polymerization rate and average molecular weight. It has been found that rate depends upon monomer concentration to the first power and that average molecular weight increases with increasing monomer concentration. Material of desirable average molecular weight was produced at 1 to 2 percent monomer concentrations in water. Temperature increase caused an increase in rate but had little effect on average molecular weight. Increasing intensity of the gamma radiation caused increase in rate but decrease in average molecular weight. The polymerization rate and average molecular weight decreased as water was replaced with alcohol and chlorinated solvents. The polymer produced by radiation has a narrower molecular weight distribution and it was found that radiation of the polymer caused a decrease in average molecular weight. (auth)

1782

CHEMICAL EFFECTS OF (d,p), (n,2n), AND (γ,n) ACTIVATION OF IODINE. Robert H. Schuler (Brookhaven National Lab., Upton, N. Y.). J. Chem. Phys. 22, 2026-9 (1954) Dec.

The organic retentions for (d,p), (n,2n), and (γ,n) activation of iodine in liquid methyl and ethyl iodide, containing

added iodine, have been found to be equal to the retentions observed in radiative neutron capture. This demonstrates that the chemical effects are independent of the recoil energy of the activated nucleus, of the mode of nuclear formation, and of variation of fragmentation effects within the recoil track. In the absence of scavenger iodine, the increase in retention due to radiation damage is less than 10 percent in all cases studied. (auth)

RADIATION EFFECTS

1783

Army Medical Research Lab., Fort Knox

EFFECT OF SOFT X-RAYS ON THE LUMINESCENCE EFFICIENCY OF BIOLOGICAL COMPOUNDS. W. H. Parr, J. G. Kereiakes, and A T. Krebs. Aug. 23, 1954. 15p. (AMRL-156)

The luminescence efficiency of different biological compounds under high-energy gamma bombardment before and after 50-kv x irradiation was investigated. After x irradiation crude catalase showed no change; ascorbic acid luminescence increased; and glutathione luminescence decreased. Parallel measurements made on the luminescence changes and chemical changes of the solute indicate that the luminescence curve does not follow closely the decomposition curve. These studies illustrate the influence of the radiation-induced decomposition products and are of importance in considering the biological reactions induced by ionizing radiation. (auth)

1784

Oregon State Coll.

THE LUMINESCENCE OF ALKALI HALIDES ACTIVATED BY HEAVY METALS. FINAL REPORT [FOR] PERIOD JULY 1, 1952 TO DECEMBER 31, 1954. Allen B. Scott. 37p. Contract DA-04-200-ORD-132. (NP-5505)

A review of the important work, both experimental and theoretical, having a bearing on the luminescence of alkali halides activated by heavy metals and published prior to 1953 is presented. An extensive bibliography is included. Reference is made to previously distributed technical reports which describe the determination of the formula of thallous complexes in chloride solutions which luminesce. Thallium exists as the simple Tl + ion, TlCl molecules having a dissociation constant of 0.26 in KCl solution at 25°C, and $TlCl_2^-$ having a constant for the dissociation $TlCl_2^- = TlCl + Cl^-$ of 1.7 at 25°C. Absorption data are consistent with these results. At Cl^- concentrations above about 2.5 M, there is some evidence for the existence of a more highly coordinated complex of thallium. It is not yet known which of these forms plays a role in the luminescence, but study of this aspect of the problem is continuing. Experiments on solid phosphors are not yet complete. Apparatus for the growth of the single crystals, measurement of magnetic susceptibility, and detection of transfer in solids, has been built and some preliminary results are presented. (auth)

1785

HIGHLY INTENSE RADIATION FIELDS AND THEIR EFFECTS ON SYNTHESIS AND PROPERTIES OF HIGH POLYMERS. David S. Ballantine (Brookhaven National Lab., Upton, N. Y.). Mod. Plastics 32, No. 3, 131-2; 134; 136; 138-9; 142; 228-30; 232(1954) Nov.

During the past five years there has been much speculation on the possible application of highly intense radiations to problems in the polymer field and an increasing volume of research on the possibilities in the synthesis of new polymers and the improvement of the physical properties of presently existing polymers. Gamma radiation offers some unique advantages as an initiating agent in that 1) initiation can be effected at low temperatures where heat-sensitive monomers can be polymerized, 2) polymerizations can be carried out in the solid state, and 3) polymers can be made with no contamination from catalyst fragment. Recent work has shown that the physical properties of polymers can be markedly altered by exposure to radiation fields and that a vulcanization type process takes place. In this paper the work completed to date is reviewed and the industrial potential of intense radiation fields is evaluated. The types and characteristics of various sources of intense radiation that now exist or may exist in the future are discussed. (auth)

SEPARATION PROCEDURES

1786

THE PROCEDURE FOR SEPARATIONS IN A DROP. Herbert Weisz. Translated by F. Hudswell from Mikrochim. Acta, 140-7(1954). 6p. (AERE-Lib/Trans-474)

A new simple method is given for separating ions or groups of ions in a single drop. Two pieces of equipment have been developed for this purpose. One serves for the simple conduct of precipitations on filter paper with gaseous reagents. An apparatus, designated as a ring oven, is designed to wash the soluble materials from a spot flock and to concentrate them in a sharply bounded circular zone, where they can be detected. The utility of the procedure is demonstrated by typical examples. (auth)

1787

PRODUCTION OF BERYLLIUM OXIDE FROM BERYL. P. B. Chakravarti (National Metallurgical Lab., Jamshedpur, India). J. Sci. Ind. Research (India) 13, 783-7(1954) Nov.

Experiments on a semi-pilot plant scale have been carried out on the fluoride process for the extraction of beryllia from beryl. The efficiency of the process and the purity of the product obtained compare favorably with those obtained in other countries. (auth)

1788

PREPARATION OF VERY PURE YTTRIUM OXIDE BY ION EXCHANGE. Jean Loriers and Josiane Quesney. Compt. rend. 239, 1643-5(1954) Dec. 8. (In French)

SORPTION PHENOMENA

1789

Georgia Inst. of Tech. Engineering Experiment Station.

STANDARDIZATION OF SURFACE PROPERTIES OF FINE PARTICLES. FINAL REPORT. Clyde Orr, Jr., H. G. Blocker, and Jane B. Garrett. Apr. 30, 1954. 48p. Contract DA-36-039-sc-42588. (AD-34004)

In an evaluation of the surface properties of finely divided solid materials, an investigation was made of heats of adsorption, i.e., the heat released at a solid's surface upon contact with a gas. Two independent methods were used in making heat of adsorption measurements. Experimental data were obtained for a Ni–silica catalyst, powdered Ni, and coconut charcoal. Considerable attention was given to gas purification, to solid surface preparation, and to pressure measurements in the low-pressure range. Most extensive investigation was given to the charcoal. For this material, it was found that the first molecules of

N gas adsorbed gave up considerably more energy than condensation released, and that later adsorbing molecules gave up only a little more energy than is released by the process of condensation, while still later adsorbing molecules gave up approximately twice the heat of condensation until complete monolayer coverage of the solid's surface resulted. The other materials gave similar results in the range of conditions in which they were investigated. Since other investigators have obtained widely differing results, and since minor impurities are thought to alter the results obtained to a very great degree, future research in the field must give extensive consideration to impurities. (auth)

1790

Ames Lab.

THE ADSORPTION OF HYDROCARBONS FROM METHANOL AND ETHNOL SOLUTIONS BY NON-POROUS CARBONS. Robert S. Hansen and Robert D. Hansen. [Aug. 17, 1954]. 13p. Contract [W-7405-eng-82]. (ISC-512)

Isotherms for the adsorption of octane, decane, and dodecane from methanol solution by Graphon, Spheron-6, and DAG-1 have been determined at 25°C over the range of hydrocarbon solubilities. Multimolecular adsorption of all of these hydrocarbons is demonstrable on Graphon and Spheron-6, and strongly indicated on DAG-1. Isotherms for the adsorption of decane and dodecane from ethanol by these same adsorbents have been determined over the entire concentration range. Primary dependence of adsorption on solute activity referred to pure liquid solute as standard state is again demonstrated. Surface excesses of hydrocarbon on Graphon markedly exceed those on Spheron-6 and DAG-1 at given hydrocarbon activities, and the latter two adsorbents show adsorption inversion in the completely soluble systems. (auth)

1791

THE INFLUENCE OF AGITATION ON THE KINETICS OF ABSORPTION OF CARBON DIOXIDE BY SODIUM CARBONATE SOLUTIONS. M. Kh. Kishinevskii and R. M. Novik. Translated by V. Beak from Zhur. Priklad. Khim. 26, 673-80(1953). 9p. (AERE-Lib/Trans-463)

The kinetic regularities of the process of absorption are determined by the hydrodynamical conditions under which the process is carried out. The equation $\frac{dw}{d\tau} = \frac{[mC\ 1 - e^{-PHK}] + HP}{\rho}$ correctly describes the kinetics of absorption of CO_2 by Na_2CO_3 solutions and explains the apparent contradiction in results of a number of works. The activation energy of the reaction between CO_2 and Na_2CO_3 is 13000 cal. (auth)

SYNTHESES

1792

Virginia-Carolina Chemical Corp.

ORGANIC PHOSPHORUS COMPOUNDS. DEFINITIVE REPORT [FOR] DECEMBER 10, 1953 - DECEMBER 31, 1954. (PROJECT 890). J. R. Mangham, C. L. Harowitz, and T. M. Melton. Dec. 31, 1954. 22p. (RMO-2944)

The chemical names, structures, and physical properties of 21 different organic phosphorus compounds prepared during the year are presented. Preparative methods are given which illustrate the synthesis of at least one example of each class of chemical structure represented. These compounds include 8 amides, 4 acids and esters, 2 phosphonium halides, and 7 phosphorus derivatives of polyhydroxy compounds. A summary by name and structure of 24 additional organic phosphorus compounds prepared to date are appended. (C.H.)

URANIUM AND URANIUM COMPOUNDS

1793

ON THE USE OF ION EXCHANGERS FOR DETERMINATION OF TRACES OF IMPURITIES IN URANIUM. I. G. Draganic, Z. D. Draganic, and Z. I. Dizar. Translated by C. A. Horton from Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 4, 37-44(1954). 9p. (AEC-tr-1994)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-884.

1794

CONSIDERATIONS ON THE URANIUM OXIDES BETWEEN UO_2 AND U_3O_8. P. Perio. Translated by Carl Demrick from Bull. soc. chim. France, 840-1(1953). 5p. (AEC-tr-2061)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 7-6436.

1795

THE EQUILIBRIUMS OF URANIUM OXIDES BETWEEN UO_2 AND U_3O_8. (Sur Les Equilibres Des Oxydes Duranium Entre UO_2 Et U_3O_8). H. Hering and P. Perio. Translated by Carl Demrick from Bull. soc. chim. France, 351-7(1952). Translation of the journal reprint issued as CEA-140, in French. 17p. (AEC-tr-2062)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 6-3773.

1796

RECENT WORK ON THE CHEMISTRY OF URANIUM OXIDES. (Travaux Recents Sur La Chimie Des Oxydes D'uranium). M. J. S. Anderson. Translated by Carl Demrick from Bull. soc. chim. France, 781-8(1953). 15p. (AEC-tr-2065)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 7-6435.

1797

LOW PRESSURE HYDROGEN SOLUBILITY IN URANIUM. H. C. Mattraw (Knolls Atomic Power Lab., Schenectady, N. Y.). J. Phys. Chem. 59, 93-4(1955) Jan.

The solubilities of H_2 in U at various low pressures and at 295°C using 10g of powdered U are reported, and results are tabulated. For this low H_2 concentration region the solubility is expressed by $S = K\sqrt{P}$, where S is in standard cc/10g of U and P ranged from 26 to 150μ. Results showed the solubilities of H_2 ranged from 0.0353 for the lowest pressure to 0.0335 at the highest. (J.A.G.)

ENGINEERING

AEROSOLS

1798

Battelle Memorial Inst.

DEVELOPMENT OF A RADIOACTIVE DUST COLLECTOR. PROGRESS REPORT NO. 3. R. D. Ellsworth, I. M. Saslaw, R. Rauch, and J. E. Yocom. Dec. 15, 1953. 26p. Contract DA18-108-CML-5095. (NP-5485; ETF-760.92-2/3)

The sonic dust generator as described in the Second Progress Report has been completed and found to require several modifications before it can be used satisfactorily.

A standardized fine air-cleaner test dust, classified from natural Arizona dust, has been obtained and a size distribution of this dust is presented. An apparatus designed to test the control of isokinetic flow through the sampler, by the technique described in the last report, has been completed. Preliminary data obtained from this equipment are also presented. Specifications have been prepared for an automatic filter-feeding mechanism, and two alternate designs of this unit have been included in this report. Specifications for an instrument-orienting mechanism, to insure that the sampling port always faces into the wind, have also been prepared. Design of this unit is well under way, and will be completed before the next report period. (auth)

1799

Battelle Memorial Inst.

DEVELOPMENT OF A RADIOACTIVE-DUST COLLECTOR. PROGRESS REPORT NO. 4. R. D. Ellsworth, W. A. Spraker, and J. E. Yocom. Feb. 15, 1954. 23p. Contract DA18-108-CML-5095. (NP-5486; ETF-760.92-2/4)

The operational difficulties encountered when using the sonic dust generator described in earlier reports made it necessary to design a more positive type of dust-feeding mechanism for some of the test work. A brief description of this dust feeder is included in this report. Also, the results of some preliminary tests to determine the amount of wall loss which occurs in the horizontal cone are discussed. Two designs for a filter-feeding mechanism are presented and discussed. Because of its simplicity and compactness, it is concluded that the rotary-disc type of mechanism is the most suitable and should be detailed and built. In the discussion of the isokinetic control, it is pointed out that the effect of the wall boundary layers inside the small sampling and metering nozzles were so great that the controlling circuit was too sensitive when using hot wires in the inlet opening. A hot wire was placed just downstream of the filter and calibrated. The results, which were consistent and reproducible, are included in this report. Future plans for this isokinetic-sampling control are outlined. (For preceding period see NP-5485.) (auth)

1800

Battelle Memorial Inst.

DEVELOPMENT OF A RADIOACTIVE-DUST COLLECTOR. PROGRESS REPORT NO. 5. R. D. Ellsworth, W. A. Spraker, R. H. Blackmore, E. C. Foudriat, and J. E. Yocom. Apr. 15, 1954. 31p. Contract DA18-108-CML-5095. (NP-5487; ETF-760.92-2/5)

The unsatisfactory sample obtained when using the horizontal, seven-degree cone made it necessary to test various nozzle arrangements. The results of this investigation are included in this report. The vertical, 45-degree cone has given the best results to date, but much more work along this line is needed. The filter-feeding mechanism is being fabricated and should be ready for a field model by the middle of May. Velocity-sensing heads of the thermocouple type have been investigated as a means by which the sampling rate can be controlled and recorded. The laboratory results are promising. The principle and description of this apparatus are included. Radiochemical studies have been initiated to provide a test dust suitable for simulated field conditions. Work was also done on the development of a technique for determining the ratio of radioactive to nonradioactive particles, as well as measuring the gross activity and particle size of the material collected on a millipore filter. The results to date indicate that the stripping emulsion has the best possibilities, although more work is needed. (For preceding period see NP-5486.) (auth)

1801

Battelle Memorial Inst.

DEVELOPMENT OF A RADIOACTIVE-DUST COLLECTOR. PROGRESS REPORT NO. 6. R. D. Ellsworth, W. A. Spraker, and J. E. Yocom. June 15, 1954. 24p. Contract DA18-108-CML-5095. (NP-5488; ETF-760.92-2/6)

Additional runs have been made with the laboratory sampler. These runs were designed to determine the effect of inlet configuration on the symmetrical distribution of dust on millipore filters and on losses of dust to the walls of the inlet section. It was shown that both a 90- and 45-degree cone gave somewhat better results than other configurations tested. The ability of a millipore filter to retain large particles on its surface after collection was studied. Dust samples whose mean diameters covered the range between 3 and 75 microns were collected on filters and then attempts were made to jar the particles from the surface of the filter. It was found that most of the particles larger than 10 microns could be dislodged from the filter surface by tipping the filter on its edge and tapping it gently. A system for controlling flow through the sampler by means of heated thermocouples has been set up and has undergone preliminary testing. The system is able to control flow quite satisfactorily except at low velocities where there is some inaccuracy. It is felt that the basic principle of the system is sound and only minor requirements will be needed. The filter-feeding mechanism has been completely assembled, and its operation appears satisfactory. A complete cycle exclusive of sampling and purging time requires about 20 seconds. Work has continued on the development of a technique for producing autoradiographs of radioactive particles. Several improvements in the method are described. (For preceding period see NP-5487.) (auth)

1802

Battelle Memorial Inst.

DEVELOPMENT OF A RADIOACTIVE-DUST COLLECTOR. FINAL REPORT. W. A. Spraker and R. D. Ellsworth. Sept. 23, 1954. 59p. Contract DA18-108-CML-5095. (NP-5489; ETF-760.92-2/Final)

This is the final report on the development of a radioactive-dust collector. The major requirement of this collector is that it sample the air isokinetically, that is, that the sampling rate be proportional to the velocity of the prevailing wind over a range of 5 to 20 miles per hour. In addition, the sampler must retain particles in the size range from 0.1 to 100 microns, be portable, be powered by 24-volt batteries, have a timing system to control the frequency and duration of sampling, and be constructed to resist corrosion and the shock loads to be expected in field use. The major units which make up the sampler developed to meet these requirements include a hot-wire thermocouple velocity-sensing head and associated electronic amplifier and control motor, a newly developed flow-control valve, a filter-changing and storage apparatus, a converter to change the battery output to 110-volt 60-cycle current, and a vacuum pump and motor. These units have been assembled in boxes which can be carried by two men without difficulty. The design and development of a

velocity-control system of the type required presented problems not usually encountered in control work, since the required frequency response is moderately rapid and the allowable error is small. An electronic system presented the most likely solution. A system based on hot-wire thermocouples was devised. This consists of two velocity-sensing heads, one detecting the ambient-air velocity and the other sensing the velocity of the sampling air. The outputs of these two heads are wired in opposition so that no signal results if the velocity at both heads is the same. If a velocity difference exists, the resulting signal is amplified by a servo amplifier and used to drive a motor which positions a valve in such a manner as to decrease the signal difference. Operation of this system has been successful. The flow-control valve which is actuated by the servomotor runs at vacuums ranging from one to three inches of mercury due to the type of filter used. The valve is based on compressible-flow relationships and the required valve flow and pressure drop. Tests of this valve confirmed the theoretical analysis and resulted in a high-pressure-drop valve having an almost linear relationship between valve position and pressure drop and between valve position and flow. This valve characteristic considerably simplified the design of the servo amplifier and control system since the servo system does not have to compensate for the usual nonlinearity in the control valve. A major problem in the design of the filter-changing and storage unit was the design of an adequate seal around the filter during sampling. This seal must withstand approximately three inches of mercury vacuum and also allow the filter to slide into position during the filter-changing operation. A spring-loaded synthetic hard rubber seal was developed which has very low leakage and does not interfere with the mechanical operation of the unit. The remainder of this unit is a fairly straightforward design consisting of a motor-driven filter feeding disk controlled by a microswitch and cam. The vacuum pump and motor, the rotary electrical converter, and the timer and commercial items. The converter is used since the servo system requires 110-volt 60-cycle current. It is therefore simpler to convert the direct-current battery current to alternating current to supply the whole unit, rather than to supply part of the unit with direct current and the remainder with alternating current. This system offers the additional advantage that the batteries and converter are not necessary if an alternating-current supply is available at the test site. (auth)

HEAT TRANSFER AND FLUID FLOW

1803

Fluid Motion Sub-Committee, Aeronautical Research Council (Great Britain)

A SIMPLE APPROACH TO THE THEORY OF SECONDARY FLOWS. J. H. Preston. Dec. 10, 1953. 18p. (AD-40917)

A simple method has been developed for computing the secondary trailing vorticity which arises when a non uniform stream is turned. It was found in the case of a sudden deflection of a non uniform stream that there was no net trailing vorticity downstream of the bend and therefore no secondary flow. It was also found that for small angles of deflection there is no net circulation downstream of a cascade of circular arc aerofoils of finite dimensions. It is inferred that this should be true also for large deflections. (M.P.G.)

1804

Argonne National Lab.

HEAT TRANSFER TO BOILING WATER FORCED THROUGH A UNIFORMLY HEATED TUBE. J. F. Mumm. Nov. 1954. 57p. Contract W-31-109-eng-38. (ANL-5276)

An electrically heated, horizontal, Type 347 stainless steel tube (0.465 in. ID by 0.505 in. OD by 7 ft long) was used to obtain local coefficients of heat transfer in the region of net steam generation. The maximum weight fraction evaporated was 0.60. The investigation covered a range of pressures from 45 to 200 psia, of heat fluxes from 50,000 to 250,000 Btu/(hr)(sq ft), and of flow rates from 70 to 280 lb/(sec) (sq ft). The data were correlated by means of the dimensionless equation

$$\frac{hD_e}{k} = \left[4.3 + 5.0\times10^{-4}\left(\frac{V_{fg}}{V_f}\right)\right]^{1.64}\left[\frac{q''}{Gh_{fg}}\right]^{0.464}\left[\frac{GD}{\mu_f}\right]^{0.888}$$

with a root mean square deviation of 10%. (auth)

1805

Lewis Flight Propulsion Lab., NACA

EXPERIMENTAL INVESTIGATION OF FREE-CONVECTION HEAT TRANSFER IN VERTICAL TUBE AT LARGE GRASHOF NUMBERS. E[rnest] R. G. Eckert and A. J. Diaguila. Aug. 29, 1952. 37p. (NACA-RM-E52F30)

Local free-convection heat-transfer coefficients and temperature fields in the turbulent flow range were obtained within a vertical, stationary tube closed at the bottom, heated along its walls, and having a length-to-diameter ratio of 5. Convective heat-transfer coefficients were correlated by the general relations for free-convection heat transfer. These coefficients converted to dimensionless Nusselt numbers were 35% below known relations for vertical flat plates. Air temperature measurements within the tube indicated a thin boundary layer along the heated wall surface and unstable conditions in the air flow. (NACA abst.)

1806

Mine Safety Appliances Co.

FLOW DECAY IN A SODIUM HEAT TRANSFER SYSTEM. R[obert] A. Tidball and F. L. Mangold. Jan. 11, 1955. 24p. Contract NObs-65426, Technical Report No. 35. (NP-5491)

Isothermal flow decay studies were made on the sodium side of the 1000 kw steam generating system, and the results compared with decays calculated by an analytical technique developed for SIR emergency cooling predictions. A total of eleven tests were run: seven at 800 to 850°F sodium temperature and four at 580°F sodium temperature. Initial flow rates of 75 and 50 gpm were used for each condition. In all cases there was a more rapid decay than predicted—at one second the flow was about 55% of the predicted flow. (auth)

1807

Tennessee Univ.

EFFECT OF WETTING ON HEAT TRANSFER CHARACTERISTICS OF LIQUID METALS. PROGRESS REPORT. R. M. Boarts, Harold Chelemer, and Bernard Hoffman. Feb. 1, 1954. 11p. Contract AT(40-1)-1310. (ORO-121)

Progress is reported on the determination of the effect of wetting on the heat transfer characteristics of Hg by the use of additive wetting agents and variation of the heat transfer material. An effort was made to reduce the detachment effect of a modified Hg flow system (ORO-93) by

operating under vacuum and by eliminating splashing of Hg in the reservoirs. The former showed little change, but a marked decrease in the detachment effect resulted from the latter change, indicating they were caused by entrained gas. Investigations on a smaller scale showed that detachments like those above could be obtained by applying a vacuum to a glass vessel containing Hg which had been vigorously aerated. The density of aerated Hg was found to be as much as 12% less than that of nonaerated Hg. The design of an apparatus to be used in measuring the temperature distribution in a steel–Hg–steel system is presented. (J.A.G.)

1808

Royal Aircraft Establishment, Farnborough, Hants (England)

HEAT TRANSFER FROM CIRCULAR FINNED CYLINDERS UNDER NATURAL CONVECTION CONDITIONS. Mary D. Wright and G. A. French. Mar. 1954. 18p. (RAE-TN-EL-68; AD-40019)

The natural cooling of circular finned cylinders has been investigated. The cylinders were ~6.5 in. long and fin diameters varied from 2.5 to 4.5 in. The effects of fin thickness, diameter, spacing, and finish were studied. It was concluded that for the fins tested there was an optimum spacing of 0.25 in. for maximum heat dissipation. This was substantially independent of temperature and fin dimensions. The experimental convective loss may be represented by the equation $H_c = (KA_t/L^{0.25}) \times \theta^{1.25}$ watts, where A_t is the total surface area in cm^2, L is the diameter of fins in cm, and θ is the temperature difference. K is dependent on spacing, having a value of 0.365×10^{-3} for the optimum spacing of 0.25 in. and attaining a steady value of 0.48×10^{-3} as the spacing is increased. It was concluded that optimum fin spacing will increase with altitude, being ~twice the ground level value at 50,000 ft. (M.P.G.)

1809

GENERALIZATION OF THE EXPERIMENTAL DATA ON THE HEAT TRANSMISSION AT THE BOILING OF LIQUIDS UNDER THE CONDITIONS OF FREE CONVECTION. G. N. Kruzhilin. Translated by Carl Demrick from Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk, 701-12(1949). 16p. (AEC-tr-2000)

The results of the generalization of the known experimental data on the heat transmission at the boiling of various one-component liquids at free convection are discussed. The generalization is made on the basis of dimensionless equations obtained by analysis of the problem according to the method of similarities. (auth)

1810

HEAT TRANSMISSION FROM A HEATING SURFACE TO A BOILING ONE-COMPONENT LIQUID AT FREE CONVECTION. G. N. Kruzhilin. Translated by Carl Demrick from Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk, 967-80(1948). 20p. (AEC-tr-2060)

1811

HEAT TRANSFER ON EVAPORATION. G. Sarukhanian. Translated by Carl Demrick from Chem. Ing. Tech. 25, 477-80(1953). 10p. (AEC-tr-2063)

A brief survey is given on heat transmission of boiling liquids. Formulas are presented for setting up a general equation according to data from recent Russian literature. (auth)

1812

APPROXIMATE CALCULATION OF TURBULENT RESISTANCE. Bl. Dolapchiev (Mathematics Inst., Sofia, Bulgaria). Doklady Akad. Nauk S.S.S.R. 98, 743-6(1954) Oct. 11. (In Russian)

MATERIALS TESTING

1813

Lewis Flight Propulsion Lab., NACA

INVESTIGATION OF TEMPERATURE LIMITATION OF VARIOUS LUBRICANTS FOR HIGH-TEMPERATURE 20-MILLIMETER-BORE BALL BEARINGS. Z[olton] N. Nemeth and W[illiam] J. Anderson. [Nov. 10, 1954]. 32p. (NACA-TN-3337)

Twenty-millimeter-bore tool-steel ball bearings, equipped with either a beryllium copper or an Inconel cage, were operated with liquid and with solid lubricants at temperatures from 100° to 1000°F at a speed of 2500 rpm and a thrust load of 110 lb. Solid lubricants were more effective than fluid lubricants at the higher temperatures. Graphite provided effective lubrication to 1000°F with bearings equipped with either a beryllium copper or an Inconel cage; molybdenum disulfide, to 850°F with a bearing equipped with an Inconel cage. A silicone-diester blend, the best high-temperature liquid lubricant provided effective lubrication to 700°F and allowed operation of the bearing at 850°F although the bearing operation was rough and friction torque was high. (auth)

1814

Standard Oil Co. of Ind.

DEVELOPMENT AND EVALUATION OF HIGH TEMPERATURE GREASES. QUARTERLY REPORT NO. 13. Edward A. Swakon and Arthur C. Borg. July 1954. 24p. Contract AF33(038)-23687. (NP-5495)

Work has been directed toward developing arylurea (ASU)–silicone greases for the temperature range from -65° to 450°F greases made with fluids other than straight silicone oil for the same temperature range but with better lubricity. An attempt is being made to improve the lubricity of silicone greases with additives. Of 29 compounds evaluated on the Navy gear-wear tester, three look promising. These are Molykote, 1,1,1,2,3,3,3-heptachloropropane, and 1,1,1,2,2,3,3-heptachloropropane. A passing test under 5 lb load was obtained with 5% of each of these compounds in an ASU-DC550 silicone fluid grease. Under mild conditions on the Shell four-ball wear machine, 1 and 5% concentrations of each of the chloropropanes in DC550 silicone fluid were effective in reducing wear. The effect of composition of brass on wear with silicone greases was determined on the Navy gear-wear tester. Tests were conducted on eight brass compositions in which the lead content ranged from 0 to 3.6%, three of which contained approximately 0.8% tin. A correlation exists between wear and amount of tin and lead in the brass. The amount of wear decreased with decreasing lead content. For the same lead content, wear was less with those brass compositions containing tin. A heptachloropropane additive in the lubricant was effective in reducing wear with each brass composition. In preparation for making greases with fluids other than straight silicone, the heat stability and volatility of six classes of fluids were determined at 350°F. Of the 14 uninhibited and inhibited fluids evaluated, inhibited diisooctylazelate and petroleum oil of 20 grade,

uninhibited petroleum oils of 20 and 40 grades, and mixed diphenylindonyl phosphate exhibited the lowest volatility and change in viscosity after one week at 350°F. Seventeen bearing tests at 350°, 400° and 450°F were completed. At 450°F, eight tests on ASU-DC550 greases ran from 210 hours to 825 hours, three tests on ASU-GE81406 greases ran from 127 hours to 261 hours and test on silica-petroleum grease and on a silica-silicone grease being used by British Armed Forces ran 7 and 274 hours, respectively. At 400°F a test on ASU-DC510 grease ran for 615 hours and two tests on the British Armed Forces' grease ran 20 and 55 hours. At 350°F, a test on the silica—petroleum grease ran for 253 hours. (auth)

1815

Massachusetts Inst. of Tech.

THE STATISTICAL THEORY OF SIZE AND SHAPE EFFECTS IN FATIGUE. Frank A. McClintock. Nov. 4, 1954. 24p. Contract AF18(600)-895. (OSR-TN-54-351)

Fatigue specimens are considered in which the stress amplitude is constant with respect to time but falls off parabolically along the length of the specimen from the point of maximum stress. From assumptions regarding the local variability in the strength of the material, equations are derived relating the scatter in cycles to failure to the scatter in position of failure. The effect of specimen size is determined for these two types of scatter, as well as for the average life. It is found that the shape of the distribution function does not seriously affect the relation between scatter in cycles to failure and scatter in position of failure. The size effect, however, is markedly influenced by the shape of the distribution function. A modification is suggested to make the results applicable to tests to determine the endurance limit, where the stress amplitude is a variable. (auth)

1816

Massachusetts Inst. of Tech.

A CRITERION FOR MINIMUM SCATTER IN FATIGUE TESTING. Frank A. McClintock. Nov. 29, 1954. 20p. Contract AF18(600)-895. (OSR-TN-55-1)

When a number of fatigue tests are run on specimens with a longitudinal radius of curvature, there results a scatter in both the number of cycles to failure and the position of failure. A previous statistical analysis showed that if the variations in life are due solely to local inhomogeneities in the specimen, then there is a definite relation between the scatter in position of failure and the scatter in the number of cycles to failure. If the scatter in life significantly exceeds that corresponding to the scatter in position of failure, then there is some factor other than local inhomogeneities contributing to the scatter in life. Such other factors can be eliminated by improving the experimental technique. The usefulness of this criterion is illustrated by its application to crack detection tests on polycrystalline ingot iron. (auth)

1817

Western Gear Works

DEVELOPMENT OF A GEAR AND SPLINE LUBRICANT TESTER. John Morris, Joseph Goldsworthy, John Scott, and Charles Sauter. Oct. 1954. 91p. Contract AF 33(616)-496. (WADC-TR-54-37)

Results of a compilation of lubricants, lubrication, and lubricant tester data include a selected bibliography with abstracts which has been arranged so that references are listed under the subject heading most applicable. Design of a gear and spline lubricant tester which will accommodate, as test specimens, all the most popularly used types of gears; such as, spur, helical, worm, straight bevel, spiral bevel, and hypoid, as well as splines, is described. The lubricant tester will be capable of test gear speeds up to 30,000 RPM and tooth loads up to 6000 lb per in. of face width. The design of the tester was based on the analysis of information from sources listed in the bibliography, gear lubrication experience, and preliminary design studies of possible new simulation, as well as gear type testers. It is concluded that a universal type, gear lubricant tester should prove advantageous in selecting lubricants for specific applications, as well as placing lubricants into a general classification of usefulness as gear lubricants. (auth)

PUMPS

1818

THE DESIGN OF JET PUMPS. (INJECTORS AND EJECTORS). (Berechnung Von Strahlapparaten). Gustav Flügel. Translated from VDI-Forschungsheft 395, 1-21 (1939). 66p. (NACA-TM-982)

It is shown that by applying both the energy and impulse theories the optimum throat dimension of the mixing nozzle and best shape of intake can be predicted approximately in a relatively simple manner. The necessary length of the mixing nozzle follows from Prandtl's turbulent mixing theory. The calculations are carried out for the mixing of similar and dissimilar fluids. (L.T.W.)

RADIOGRAPHY

1819

GAMMA-RADIOGRAPHY IN OIL STORAGE INSTALLATIONS. II. C. C. Bates (Welding Supervision Ltd., London, England). Atomics 6, 5-8(1955) Jan.

The successful application of radiographic non-destructive inspection is recounted and the reasons for the selection of radioactive isotopes are reviewed. The advisability of coordinating this inspection tool with overall welding supervision is also discussed. Standards of radiography achieved and safety precautions necessary are also briefly examined. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

1820

Battelle Memorial Inst.

MECHANICAL-PROPERTY TESTS ON CERAMIC BODIES. [ANNUAL REPORT]. W. H. Duckworth, A. D. Schwope, O. K. Salmassy, R. L. Carlson, and H. Z. Schofield. Mar. 1952. 87p. Contract AF33(038)-8682. (WADC-TR-52-67; AD-3245)

A critical survey was made of the significant theories of strength, for guidance in developing relationships among the strength properties of ceramics. The mechanistic theories appeared to offer the greater possibilities, but no theory treated all controlling variables, and all theories lacked adequate experimental support. The need remains apparent for a unified theory and supporting experimental

data. The principal laboratory effort was on the size dependence of strength. Both plaster and a nickel–titanium carbide body decreased in apparent strength with increases in gage-section size in bend tests. In an extensive program of bend tests on plaster to record details, strength decreased with increases in either gage-section length or gage-section breadth in about the same manner. The apparent strength increased with increases in gage-section depth. The possibility of the true size effect's being masked by size-dependent testing variables was indicated. There was no trend apparent in the standard deviation of strength values with variations of gage-section length, breadth, or depth. Further information was obtained on the effect of the type of test on mechanical properties. Of particular interest is the fact that, with sufficient refinement, the bend and torsion tests appear to yield practically the same strength values. (auth)

1821

VACUUM-THERMAL PRODUCTION OF BORIDES OF DIFFICULTLY FUSIBLE METALS. G. A. Meerson and G. V. Samsonov. Zhur. Priklad. Khim. 27, 1115-20(1954) Oct. (In Russian)

A vacuum technique for the preparation of metal borides by the reaction $MeO + B_4C + C \rightarrow MeB + CO$ is described. TiB_2, ZrB_2, VB_2, NbB_2, TaB_2, and W_2B_5 have been prepared by this method. Lattice constants and densities of the prepared materials are given. (G.Y.)

CORROSION

1822

Knolls Atomic Power Lab.

CORROSION OF REACTOR STRUCTURAL MATERIALS IN HIGH-TEMPERATURE WATER. [PART] 2. STATIC CORROSION BEHAVIOR AT 600 TO 680°F. R. Fowler, Jr., D[avid] L. Douglas, and F. C. Zyzes. Dec. 1, 1954. 75p. Contract W-31-109-Eng-52. (KAPL-1248)

Possible structural materials for use in the primary coolant system and for fuel element fabrication in a water-cooled and -moderated reactor were extensively corrosion tested in static water and various aqueous media at 600 and 680°F. Both AISI Type 304 and stainless steels were found to react with water at these temperatures at a rate of 3 to 5 mg of metal/dm^2/500 hr. Carbon steel (ASTM A201) corroded at a rate approximately 10 times greater (40 mg/dm^2/mo). Steels containing 2¼ and 5% chromium corroded at about 80 mg/dm^2/mo. (auth)

1823

Los Alamos Scientific Lab.

MATHEMATICAL ANALYSIS OF GALVANIC CORROSION. PART 2. EFFECT OF INTERPOSING AN INSULATOR BETWEEN COPLANAR ELECTRODES. James T. Waber and John M. Ruth. May 1954. 25p. Contract W-7405-eng-36. (LA-1667)

The electrodes under consideration are coplanar, parallel, infinite in length, and either finite or infinite in width. A corroding liquid extends to infinity above the plane of the electrodes. The effect of placing an insulating substance between the electrodes has been calculated by conformal mapping of the region of interest into a finite rectangle, opposite sides of which are the anode and cathode. The potential fields and corrosion current densities have been determined for several specific cases. (M.P.G.)

1824

Los Alamos Scientific Lab.

MATHEMATICAL ANALYSIS OF GALVANIC CORROSION. PART 5. A TECHNIQUE FOR INCORPORATING POLARIZATION PARAMETERS INTO SIMPLER POTENTIAL FUNCTIONS. James T. Waber and John M. Ruth. Sept. 1954. 13p. Contract W-7405-eng-36. (LA-1730)

A technique is discussed for incorporating the effect of polarization into problems which have been completed but in which polarization was neglected. A number of two dimensional problems can be solved conveniently either by conformal mapping or by Fourier series. In the type of problems considered to date in this series, it has not been possible to incorporate polarization effects into the discussion when using conformal mapping solutions. In contrast, the Fourier series lends itself to the incorporation of polarization and the resulting expressions converge more rapidly than those which do not take polarization into account. In general, the polarization parameters are of the order of a few tenths of a millimeter. One cannot ignore the influence of polarization in analyzing practical problems which usually involve electrodes smaller than five centimeters. The present report augments the techniques available for the mathematical analysis of corrosion problems and permits one to include the effects of polarization into conformal mapping solutions. To illustrate the effectiveness of this method, the technique has been applied to two problems, one involving a Fourier series and the other a closed expression obtained by conformal mapping. The new solutions, which include the perturbation due to polarization, agree identically with solutions obtained directly. (For preceding report in series see LA-1686.) (auth)

1825

Oak Ridge National Lab.

THE INHIBITION OF CORROSION BY THE PERTECHNETATE ION. G. H. Cartledge. Jan. 18, 1955. 42p. Contract W-7405-eng-26. (ORNL-1833)

Theoretical consideration of alternative mechanisms to account for the action of inorganic corrosion inhibitors of the XO_4^{n-} type led to the discovery that the pertechnetate ion, TcO_4^-, inhibits the corrosion of iron and carbon steels in aerated water at temperatures up to 250°C, which was the highest temperature investigated. By taking advantage of the radioactivity of technetium, it has been shown that inhibition may be achieved without precipitation of more than radiochemical traces of film, which is probably of secondary origin, and that exposures lasting almost two years have not been accompanied by a continuous increase in the amount of precipitated technetium. The perrhenate ion, ReO_4^-, though it is externally very similar to the pertechnetate ion, did not inhibit under any conditions investigated; both radioactive and stable rhenium isotopes were used in the tests. Attempts to measure adsorbed pertechnetate ions gave results barely beyond experimental uncertainty. Inhibition necessitated the maintenance of a certain minimum concentration of pertechnetate ions in the solution; this minimum was as low as 5×10^{-5} f at 100°C in certain instances. The observations make it clear that inhibition arises from some intra-ionic property, rather than from forces due to an image charge of the ion as a whole, or from some effect due to the tetrahedral oxygen atoms of the XO_4 ion. It appears, from the effect of other electrolytes upon inhibition and electrode potentials,

that the inhibitor ion is weakly and dynamically adsorbed in competition with other ions present in solution. It is tentatively suggested that the energy of adsorption and the inhibition itself arise from electrostatic polarization of the interface under the influence of short-range polarities existing within the inhibitor particle. (auth)

GEOLOGY AND MINERALOGY

1826

Pennsylvania State Univ. Coll. of Mineral Industries
AN INVESTIGATION OF THE MINERALOGY, PETROGRAPHY AND PALEOBOTANY OF URANIUM-BEARING SHALES AND LIGNITES. (SCOPE A—SHALES). QUARTERLY PROGRESS REPORT [FOR] PERIOD OF APRIL 1, 1954 TO JUNE 30, 1954. E[rwin] O. Strahl, E[lena] Camilli, C. P. Dolsen, N. M. Short, E[ugene] N. Silverman, L[ois] Weiser Luedemann, J[ohn] C. Griffiths, H[arold] D. Wright, and T[homas] F. Bates. June 30, 1954. 16p. Contract AT(30-1)-1202. (NYO-6062)

The investigation of the pyrite nodules and lenses in the Chattanooga shale was resumed in order to study the clays that are directly associated with the pyrite. The types of clay present were sought and an attempt made to determine whether the uranium is concentrated in the pyrite or its associated clays. (For preceding period see NYO-6061.) (auth)

1827

Pennsylvania State Univ. Coll. of Mineral Industries
AN INVESTIGATION OF THE MINERALOGY, PETROGRAPHY AND PALEOBOTANY OF URANIUM-BEARING SHALES AND LIGNITES. (SCOPE B—LIGNITES). QUARTERLY PROGRESS REPORT [FOR] PERIOD OF APRIL 1, 1954 TO JUNE 30, 1954. E. F. Koppe, E. S. Erickson, Jr., C. L. Trotter, R. S. Good, W. Spackman, Jr., and T[homas] F. Bates. June 30, 1954. 24p. Contract AT(30-1)-1202. (NYO-6063)

The work has involved setting up procedures and apparatus necessary to separate the mineral fraction of the coal from the organic fraction by heavy liquid separation, low temperature air oxidation, and ozonization. A study of the association of uranium with certain chemical and physical parameters of the lignites has been initiated. A scheme of analysis has been set up and partially tested. Samples for this analysis will be collected. Crystals from highly radioactive mineralized areas of the Mendenhall lignite have been isolated and are being studied. Preliminary data indicate that the material does not appear to be indentifiable as any commonly encountered mineral. Additional radioactive material is being dissected from the coal to provide samples for chemical analyses. Fifty-one pollen and spore types are recognized from the four Mendenhall lignite beds. The occurrence of the various types in each of the four lignite seams is noted. Significant changes are detected in floral composition of the four seams by calculating the relative abundance of the microfossils in terms of their broad taxonomic affinities. Proximate analyses and sulfur determinations were made upon the Mendenhall first seam lignite. Comparison is drawn between the analysis of this coal and the analyses of "SD-1" lignite. (auth)

1828

Grand Junction Operations Office, AEC
GEOLOGIC RECONNAISSANCE OF THE DEFIANCE UPLIFT, APACHE COUNTY, ARIZONA. Kenneth G. Hatfield and C. Richard Maise. Nov. 15, 1954. 14p. (RME-71)

The Defiance uplift in northeastern Ariz. was investigated for uranium mineralization with attention concentrated on the Triassic Chinle formation because of its easily recognized ore guides. Mineralization in the area was found to be spotty and generally associated with small concretions and carbonized logs, but small deposits might occur in the Shinarump conglomerate and other unexamined formations. (auth)

1829

Minnesota Univ.
MINERAL ASSOCIATIONS IN THE URANIUM DEPOSITS OF THE COLORADO PLATEAU AND ADJACENT REGIONS. John W. Gruner, Lynn Gardiner, and Deane K. Smith, Jr. Aug. 1, 1954. 48p. Contract AT(30-1)-610. (RME-3092)

A description of the essential mineral associations in U deposits in Emery, San Juan, Uintah, Wayne, Garfield, Grand, Washington, and Piute Counties in Utah, Coconino, Mohave, and Navajo Counties in Ariz., Montrose and San Miguel Counties in Colo. and McKinley and Valencia Counties in New Mexico is reported. The listings of identifications and occurrences of the minerals make a comparison of the deposits and districts possible and profitable. Most of the deposits listed are in the Shinarump and Chinle formations. In New Mexico the described deposits are in the Todilto and Morrison formations. (J.E.D.)

1830

THE ABUNDANCE OF THE CHEMICAL ELEMENTS IN THE EARTH'S CRUST. F. Blondel. Translated by S. W. F. Patching from Chronique mines coloniales, Bur. études géol. et minières coloniales 22, 114-17(1954). 7p. (AERE-Lib/Trans-501)

1831

AIRBORNE RADIOACTIVITY SURVEY IN THE FOLKSTON AREA, CHARLTON COUNTY, GEORGIA AND NASSAU COUNTY, FLORIDA. GEOPHYSICAL INVESTIGATIONS MAP GP 119. R. M. Moxham. Washington, U. S. Geol. Survey, 1954. $0.50.

1832

AIRBORNE RADIOACTIVITY SURVEY OF THE GARDNER AREA, DE SOTO, HARDEE, MANATEE, AND SARASOTA COUNTIES, FLORIDA. GEOPHYSICAL INVESTIGATIONS MAP GP 122. J. L. Meuschke. Washington, U. S. Geol. Survey, 1954. $0.50.

1833

AIRBORNE RADIOACTIVITY SURVEY OF THE EDISTO ISLAND AREA, BERKELEY, CHARLESTON, COLLETON, AND DORCHESTER COUNTIES, SOUTH CAROLINA. GEOPHYSICAL INVESTIGATIONS MAP GP 123. J. L. Meuschke. Washington, U. S. Geol. Survey, 1955. $0.50.

1834

THE ISOTOPIC COMPOSITION OF HYDROGEN AND CARBON IN THE CARBONACEOUS CHONDRITES. Giovanni Boato (Univ. of Chicago, Ill.). Geochim. et Cosmochim. Acta 6, 209-20(1954) Dec.

A number of carbonaceous chondrites have been analyzed for hydrogen and carbon content and for the isotopic composition of these elements. Two types of these meteorites are found, the one containing about 10% of water and 2% of

carbon and the other about 1% of water and 0.3 to 0.8% of carbon. The isotopic compositions of these elements in both groups are not much different from terrestrial sources. Four stones show a deuterium content definitely outside the range of terrestrial values; this fact and a series of experiments showed that the extracted hydrogen was truly meteoritic. Thus for the first time an experimental value for the isotopic composition of the hydrogen of an extraterrestrial material has been obtained. It appears that no large isotopic fractionation of the hydrogen isotopes has occurred in the planetary system; threfore, the terrestrial deuterium abundance is probably well representative of the primeval cosmic abundance. Three groups of chondrites are apparent on the basis of carbon results; they correspond to progressively higher values for total carbon and C^{13} content. The results are discussed in the light of present theories on the formation of the planetary system and on the origin of meteorites. (auth)

1835

AGE OF THE EARTH. C. Patterson (California Inst. of Tech., Pasadena), G. Tilton (Carnegie Institution of Washington, D. C.), and M. Inghram (Univ. of Chicago, Ill.). Science 121, 69-75(1955) Jan. 21.

A new method for estimating the age of the earth is described which consists of calculating a Pb^{207}/Pb^{206} age from the observed differences between the isotopic composition of recent lead isolated from the surface of the earth where appreciable concentrations of uranium exist and the isotopic composition of lead isolated from iron meteorites where insignificant concentrations of uranium are found. (auth)

METALS AND METALLURGY

1836

Kentucky Research Foundation, Univ. of Ky.
PREFERRED ORIENTATIONS AND DEFORMATION IN TITANIUM AND TITANIUM ALLOYS. SUMMARY REPORT NO. 3 [FOR] PERIOD ENDING FEBRUARY 1, 1954. Cullie J. Sparks, Jr., C. J. McHargue, and J. R. Holland. 31p. Contract AF33(038)-19574. (AD-28253)

Titanium-molybdenum alloys in the alpha, alpha plus beta, and beta regions have essentially the same textures as the alpha titanium and body-centered cubic metals respectively. Molybdenum additions raise the temperature of annealing in titanium. The deformation elements in iodide titanium at 1500°F are $\{1\,0\,\bar{1}\,0\}\{1\,0\,\bar{1}\,1\}$ slip, and $\{1\,1\,\bar{2}\,2\}\{1\,1\,\bar{2}\,2\}$ twinning. The slip direction is $\langle 1\,1\,\bar{2}\,0\rangle$. The effect of alpha solid solution alloying elements on the hot-rolled texture of titanium is to raise the recrystallization or the preferred growth temperature. The end result of increasing rolling temperature is to align the $\langle 1\,1\,\bar{2}\,0\rangle$ direction parallel to the rolling direction instead of the $\langle 1\,0\,\bar{1}\,0\rangle$ direction which prevails at lower temperatures. The change from the split basal texture of titanium to the non-split basal by additions of aluminum is gradual and occurs over a range of concentration up to about 1% aluminum. (auth)

1837

Battelle Memorial Inst.
THE EFFECT OF GRAIN SIZE ON THE MECHANICAL PROPERTIES OF TITANIUM AND ITS ALLOYS. QUARTERLY PROGRESS REPORT NO. 5. F. C. Holden, A. A. Watts, H. R. Ogden, and R[obert] I. Jaffee. Apr. 1, 1954. 9p. Contract AF33(616)-412. (AD-31826)

Studies made on commercial titanium as an example of an alpha-titanium alloy have shown little dependence of mechanical properties on alpha-grain size and shape. Impact resistance is slightly greater for specimens having worked or fine-grained alpha structures. Bend ductilities are high in all microstructural conditions, and the endurance limit for unnotched fatigue specimens is over 80% of the ultimate tensile strength. Mechanical-property studies of a Ti-7.5Cr-7.5Mo metastable-beta alloy show no direct effect of beta-grain size. The presence of massive alpha in the microstructure, reduces tensile ductility but provides a higher endurance limit in the notched fatigue specimens. Instability of the beta phase is apparent at holding temperatures as low as 200°C. The Ti-2.5Cr-2.5Mo alloy was studied as an example of an alpha-beta-type alloy. Equilibrated alpha-beta structures, both equiaxed and acicular, were tested for mechanical properties. No effect of alpha-beta-grain size was observed, but lower tensile ductilities occur with specimens annealed in the beta field before being equilibrated in the alpha-beta field. Specimens with equiaxed alpha-beta structures show better impact properties than those with acicular structures. (auth)

1838

Ryan Aeronautical Co.
TITANIUM FORMABILITY AND WELDING CHARACTERISTICS. SEVENTEENTH MONTHLY PROGRESS REPORT. R. E. Williams and D. S. Adams. Mar. 10, 1954. 20p. Contract AF-33(600)-22169. (AD-31854; G-17-62)

(For preceding period see AD-28803.)

1839

Battelle Memorial Inst.
SPOT-WELDED JOINTS IN TITANIUM ALLOYS AND THEIR BEHAVIOR IN FATIGUE. PROGRESS REPORT [FOR JANUARY 10, 1954 TO MARCH 10, 1954]. W. H. Kearns, W. S. Hyler, and D. C. Martin. Mar. 10, 1954. 22p. Contract AF33(616)-2005. (AD-31954)

Fatigue tests were made on spot-welded joints in commercial titanium-7 % manganese alloy sheet, and S-N curves were determined with these joints. The fatigue-testing program on spot-welded joints in commercially pure titanium sheet was started. Tension-shear and cross-tension spot-welding tests were made on the experimental titanium-5 % aluminum-2½% tin alloy sheet. The mechanical properties of the sheet were determined. (auth)

1840

Materials Lab., Allison Div., General Motors Corp.
AN INVESTIGATION TO DETERMINE THE WELDING CHARACTERISTICS AND CERTAIN SUBSEQUENT MECHANICAL PROPERTIES OF THE RESULTANT WELDMENTS OF VARIOUS AUSTENITIC ALLOYS JOINED TO AMS 6415 LOW ALLOY STEEL BY TECHNIQUES CURRENTLY USED IN PRODUCTION TO FABRICATE J35-A-29 TURBINE WHEEL ASSEMBLIES. REPORT NO. 4. J. N. Benbow. Mar. 31, 1954. 56p. Contract AF-33(616)-343. (AD-32031)

This report covers the investigation made to evaluate the weldability of various austenitic stainless steel alloys. These alloys were welded to low alloy steel (AMS 6415) using AMS 5785 welding electrodes and conventional techniques, and tests of the welded joints were conducted to give data desired in determining the alloy composition which produced the most satisfactory welds. Macroscopic

and microscopic examination of the austenitic material revealed severe segregation and the presence of large inclusions, possibly oxide, in many of the bars. The presence of these defects probably influenced the results of the tests conducted. The data obtained is not considered in itself adequate to draw conclusions as to the alloy composition giving the optimum properties after welding. The ease of welding these alloys was so similar that they were considered identical in this respect and all heats were likewise considered to be generally equivalent to the material used to fabricate production turbine wheels (16-25-6 alloy). A large majority of the welded joints when tested to failure in tension, and by bending, failed at the juncture of the austenitic alloy and the weld or in heat affected zone of the austenitic alloy. (auth)

1841

Armour Research Foundation

STUDIES OF PHASE RELATIONSHIPS AND TRANSFORMATION PROCESSES OF TITANIUM ALLOY SYSTEMS. REPORT NO. 20 [FOR] MARCH 8, 1953—MAY 8, 1953. D[onald] J. McPherson and H[arold] D. Kessler. May 21, 1953. 12p. Contract AF33(038)-8708. (AD-32191)

The β-stable Ti-30% Mo and Ti-25% Mo alloys have been shown to be weldable. Soft β is retained on ice-brine quenching V—Ti alloys having 15% or more V, and in water quenching Ti—Mo alloys having 11% or more Mo. In Ti—Mo alloys with up to 11% Mo, two conditions are associated with loss of ductility and impact strength: (1) β only partially transformed to α (generally at grain boundaries) and (2) fine $\alpha + \beta$ transformation products. The existence of two different hexagonal quench products, α' and α'' were discovered in a Ti—7% Mo alloy. Single crystals of β phase in a Ti—12% Mo alloy were prepared, and a lattice parameter of 3.24 kX units determined. (L.M.T.)

1842

Armour Research Foundation

STUDIES OF PHASE RELATIONSHIPS AND TRANSFORMATION PROCESSES OF TITANIUM ALLOY SYSTEMS. REPORT NO. 21 [FOR] MAY 8, 1953—JULY 8, 1953. D[onald] J. McPherson and H[arold] D. Kessler. July 27, 1953. 26p. Contract AF33(038)-8708. (AD-32192)

Results are presented on the influence of three cooling rates on the hardnesses of Ti—Mo—V alloys, the work being directed toward circumscribing the composition range of thermally stable beta. Some preliminary hardness data on Ti—Al—V alloys are given. Further analyses of the nature and number of quench products occurring in titanium binary alloys are given. Preliminary metallographic studies on the mechanism of tempering of α' in various binary alloys are discussed. (auth)

1843

Armour Research Foundation

STUDIES OF PHASE RELATIONSHIPS AND TRANSFORMATION PROCESSES OF TITANIUM ALLOYS SYSTEMS. REPORT NO. 22 [FOR] JULY 8, 1953—SEPTEMBER 8, 1953. D[onald] J. McPherson and H[arold] D. Kessler. Sept. 28, 1953. 31p. Contract AF33(038)-8708. (AD-32193)

The further progress in determining the titanium-rich corners of the systems Ti—Mo—V, Ti—Al—V and Ti—Al—Si is described. Suitable compositional areas for aging studies have been determined for the Ti—Mo—V alloys. Isothermal sections of the Ti—Al—V system at 800, 900, 1000 and 1200°C and of the Ti—Al—Si system at 600 and 800°C are presented. Further evidence for the existence of dual martensitic quench products in Ti—Mo alloys is presented. A set of photomicrographs is presented which suggest the mechanism of α'' tempering. (auth)

1844

Armour Research Foundation

STUDIES OF PHASE RELATIONSHIPS AND TRANSFORMATION PROCESSES OF TITANIUM ALLOY SYSTEMS. REPORT NO. 23 [FOR] SEPTEMBER 8, 1953—NOVEMBER 8, 1953. D[onald] J. McPherson and H[arold] D. Kessler. Nov. 27, 1953. 27p. Contract AF33(038)-8708. (AD-32194)

Aging studies on Ti—Mo—V alloys show that β' is apparently developed, indicating that the hoped-for β stability may be lacking. Isothermal and vertical sections of the system Ti—Al—V are presented and discussed. No evidence of dual hexagonal quench products (as found in Ti—Mo alloys) were obtained for Ti—Cr alloys; average hardness values for Ti—5% Cr and Ti—7% Cr are reported. The nature of quench transformations in Ti—5% Al and Ti—10% Ta alloys were investigated. Further results on the mechanism of tempering of the α' phase in a Ti—13% Mo alloy are presented. A new technique for preparing single crystals of Ti—11% Mo alloys is described, and this will enable the mechanism of the $\alpha \rightarrow \beta$ transformation to be better studied. (L.M.T.)

1845

Armour Research Foundation

TITANIUM ALLOYS FOR ELEVATED TEMPERATURE APPLICATION. QUARTERLY REPORT NO. 11 [FOR] DECEMBER 1, 1953 TO FEBRUARY 28, 1954. W[illiam] F. Carew, F[rank] A. Crossley, and D[onald] J. McPherson. Mar. 31, 1954. 47p. Contract AF33(038)-22806. (AD-32986)

The status of alloys in preparation is summarized. The following data are given: tensile-test results including elevated temperature test data for iodide titanium-base alloys containing carbon and nitrogen, and for sponge base alloys; results of tensile tests of vacuum-annealed alloys containing 8% or more aluminum; creep-rupture results for the iodide titanium-base alloys containing carbon and nitrogen, and for several sponge titanium-base alloys; 1000-hour creep-test results for 7% Ti—3% Al—Mo and 8% Ti—4% Al—4% Zr; and tensile-test results for 6% Ti—0.5% Al—Si, 6% Ti—2% Al—V, and 7% Ti—3% Al—Mo specimens exposed to creep conditions for 1000 hours. Vacuum diffusion annealing—ostensibly to remove hydrogen—of alloys containing 8% aluminum or more did not prevent the embrittling effect of certain heat treatments except in the case of an 8% Al—4% V alloy. Creep tests of 1000 hours at 550°C and 20,000 psi stress were conducted on single specimens of 7% Al—3% Mo and 8% Al—4% Zr alloys. After testing, neither specimen exhibited measurable extension between gage marks. Extensometer measurements showed a total of 0.1% extension of the 8% Al—4% Zr alloy. In comparison, stainless steel Type 304 (18% Cr—8% Ni) is reported to have a creep rate of 0.0001% per hour (0.1% in 1000 hours) under a stress of 17,600 psi at 540°C. The 7% Al—3% Mo alloy specimen was tensile tested at room temperature after creep exposure and showed the same tensile properties as an unexposed specimen. (auth)

1846

Illinois Univ.

THE EFFECT OF DIFFERENT STATES OF STRESS ON

THE FATIGUE OF MATERIALS WITH CORRECTION FOR ANISOTROPY; AND THE BASIC LAWS GOVERNING FAILURE UNDER COMBINED STRESS. TECHNICAL REPORT NO. 2. EFFECT OF RANGE OF STRESS IN COMBINED BENDING AND TORSION FATIGUE TESTS OF 25S-T6 ALUMINUM ALLOY. W[illiam] N. Findley, W. I. Mitchell, and D. D. Strohbeck. Apr. 1954. 31p. Contract DA-11-022-ORD-995. (AD-33540)

Fatigue test data under bending, torsion, and combined bending and torsion are presented for mean stresses from zero to values which caused substantial yielding. The mean normal stresses in the bending and the torsion tests were corrected for the effect of the non linear distribution of stress resulting from yielding. The effect of stress relaxation at high mean stresses was investigated. The applicability of several theories of failure are compared with these test data. The influence of anisotropy, mechanism of crack formation, mean stress, and maximum stress are discussed. (auth)

1847

Ryan Aeronautical Co.

TITANIUM FORMABILITY AND WELDING CHARACTERISTICS. EIGHTEENTH MONTHLY PROGRESS REPORT. R. E. Williams and D. S. Adams. Apr. 10, 1954. 23p. Contract AF33(600)-22169. (AD-34369; G-17-63)

(For preceding period see AD-31854.)

1848

Case Inst. of Tech.

AN INVESTIGATION OF OVERCOMING RHEOTROPIC EMBRITTLEMENT IN TITANIUM AND TITANIUM BASE ALLOYS. QUARTERLY REPORT NO. 2 [FOR] NOVEMBER 15, 1953 TO FEBRUARY 15, 1954. E. J. Ripling. Mar. 15, 1954. 16p. Contract AF33(616)-2223. (AD-34449)

1849

Battelle Memorial Inst.

SPOT-WELDED JOINTS IN TITANIUM ALLOYS AND THEIR BEHAVIOR IN FATIGUE. PROGRESS REPORT [FOR MARCH 10 TO MAY 10, 1954]. G. E. Martin, W. S. Hyler, W. H. Kearns, and D. C. Martin. May 10, 1954. 12p. Contract AF33(616)-2005. (AD-34712)

Axial-load fatigue tests on 6-spot lap joints in 0.040-in. commercially pure titanium sheet were made at load ratios (R) of +0.02, +0.25, and +0.60. The estimated endurance limits at 10^7 cycles were 700, 900, and 1400 pounds, respectively, for the three load ratios. The static tensile strength of similar 6-spot lap joints in the titanium sheet averaged 10,670 lb. (auth)

1850

Armour Research Foundation

PILOT PRODUCTION OF PROMISING ELEVATED TEMPERATURE TITANIUM-BASE ALLOYS. PROGRESS REPORT NO. 12 [FOR] APRIL 1, 1954 TO APRIL 30, 1954. D. H. Turner and D[onald] J. McPherson. June 21, 1954. 18p. Contract AF33(616)-2060. (AD-40234)

1851

Battelle Memorial Inst.

SURVEY ON WELDING OF ALUMINUM AND MAGNESIUM. FINAL REPORT. PART 2. C. M. Craighead, P. L. Mirolo, R. D. Williams, and C. B. Voldrich. Jan. 3, 1947. 301p. Contract W33-019-ORD-5461. (ATI-9167)

The results of a survey of available information on the welding of Al and Mg base alloys such as may be utilized in ordnance material are presented. The survey indicates the possibilities and limitations of welding, and allied processes, to the fabrication of heavy-gage light alloys and the fundamental problems which require further experimental investigation. A reasonably complete survey of the literature is included. (J.E.D.)

1852

Metallurgical Labs., Dow Chemical Co.

QUARTERLY REPORT NO. 2 [FOR SEPTEMBER 1, 1951 TO DECEMBER 1, 1951]. (PHASE 1). PART 1. ROOM- AND ELEVATED-TEMPERATURE PROPERTIES OF MAGNESIUM ALLOYS CONTAINING THORIUM, RARE EARTHS AND ZIRCONIUM. (REPORT NO. 15507). [PART 2. AN EVALUATION OF FOUNDRY CHARACTERISTICS AND STATIC AND DYNAMIC PROPERTIES OF EK21D AND JK31A ALLOYS]. (REPORT NO. 15646). 45p. Contract AF33(038)-16655. (ATI-143770)

The following alloys were investigated: Mg–Zr–1, 2, and 3% Th with 1% additions of Di, Ce/Di (50/50), Mischmetal, and Ce–Free MM; 2 and 3% La with Mg–1Th–Zr; 0.5 and 1% Mn with Mg–1Th and Mg–2MM–1Th; and 2 and 4% Zn with Mg–1, 2, and 3% Th–Zr. The creep properties of cast T6 Mg–2MM–1Th–1Mn alloy at 500 and 600°F are superior to those of Mg–Th–Zr alloys. Ductility at room temperature is low due to large equiaxed grains. The Mg–Th–Mn alloys have high creep resistance at 600°F, but all other properties are lowered by the columnar grain structure. An outstanding combination of room- and elevated-temperature properties are attained in extruded T5 Mg–Zn–Th–Zr alloys. The 1% rare-earth additions improve the room- and elevated–temperature properties of Mg–Th–Zr alloys up to 500°F. The loss in creep resistance at 500 and 600°F is not as pronounced in the 1% rare-earth additions as in the 2 and 3% additions. The level of creep resistance at 500 and 600°F, however, is considerably lower than that of the Mg–Th–Zr alloys. Strength properties of the 1% additions are slightly lower than the higher rare-earth additions at all Th levels. The pouring of Mg–2% didymium–0.6% Zr and Mg–3% Th–0.7% Zr castings and experimental results are given for the evaluation of their foundry characteristics and static and dynamic properties. (auth)

1853

Foote Mineral Co.

GROUND ZIRCONIUM METAL POWDER PILOT PLANT. FINAL TECHNICAL REPORT FOR APRIL 21 TO OCTOBER 20, 1952. A. C. Demos. Oct. 29, 1952. 44p. Contracts DA-36-034-ORD-389 and DA-36-034-ORD-884. (ATI-173232)

A granular, free-flowing type of zirconium metal powder in the 100 mesh/10 μ range was produced in pilot plant quantities. Based on spark sensitivity comparable to that of ground magnesium, this material was considered nonhazardous and therefore suitable for primer manufacture. Pilot plant equipment and facilities were developed to the extent that a production rate of 25.4 lb. GFZ per 8-hr shift per day was demonstrated over a continuous 6-day operating trial. All phases of the process were operable, and coordination of zirconium handling with adequate safety measures was very satisfactory. (auth)

1854

Battelle Memorial Inst.

CREEP-RUPTURE PROPERTIES OF 6061-T6 ALUMINUM ALLOY AT 450 and 500 F. H. A. Saller, J[ohn] A VanEcho

and J. T. Stacy. Dec. 20, 1954. 14p. Contract W-7405-eng-92. (BMI-970)

The creep-rupture characteristics were determined for commercial 6061-T6 (61S-T6)* aluminum alloy at 450 and 500°F. The results are presented as design and creep-rate curves. Stress-rupture strengths at 450°F were 17,000, 13,000, and 9,000 (estimated) psi for rupture in 10, 100, and 1000 hr, respectively. At 500°F, stress-rupture strengths were 10,500, 9,100, and 7,200 (estimated) psi for rupture in 10, 100, and 1000 hr, respectively. (auth)

1855

Laboratories for Research and Development, Franklin Inst.
STUDY OF PURIFICATION AND SUBSTRUCTURE FORMATION OF METALS AND SEMICONDUCTORS AND THE PROPERTIES OF HIGH-PURITY METALS. QUARTERLY PROGRESS REPORT [FOR] OCTOBER 1, 1954 TO DECEMBER 31, 1954. Raymond L. Smith and John L. Rutherford. 16p. Contract AF18(600)-465. (NP-5470; P-2337-8)

Resistance and induction zone-melting apparatuses for the purification of metals and semiconductors are discussed, and illustrations are presented. An H_2 purification train using electrolytic hydrogen is discussed. Preliminary results on the zone melting of Fe and the removal of C from 0.4% C–Fe alloy are presented. (J.A.G.)

1856

Battelle Memorial Inst.
THE EFFECT OF MICROSTRUCTURE ON THE MECHANICAL PROPERTIES OF TITANIUM ALLOYS. INTERIM REPORT NO. 3. EFFECT OF MICROSTRUCTURE ON THE MECHANICAL PROPERTIES OF TITANIUM–MANGANESE ALLOYS CONTAINING ALPHA–SOLUTE ADDITIONS. H. R. Ogden, F. C. Holden, and R[obert] I. Jaffee. Oct. 1, 1954. 64p. Contract DA-33-019-ORD-1397. (NP-5473)

The effect of microstructure on the mechanical properties of Ti–Mn alloys containing α-solute additions of Al, C, and N is reported. The addition of alpha stabilizers to an alpha-beta alloy increases the strength of the alloy through solid-solution strengthening. Quenching heat treatments at temperatures below which the beta-to-alpha reactions are operative can alter the strength of the alloy by altering the quantities of alpha and beta phases present in the structure. Increasing the quantity of beta phase, the stronger of the two phases, increases the strength of the alloy. Also, as the quantity of beta phase is increased, the alpha-stabilizer content of the alpha phase increases, because of the partition of the alpha solutes to the alpha phase, which adds to the strength of the alloy. Interstitial alpha solutes increase the rate of alpha formation from beta by nucleation and growth, whereas the substitutional alpha solute, aluminum, decreases the rate of nucleation and growth of alpha. Consequently, the alpha-beta alloys containing interstitial solutes are more subject to beta-prime formation than are binary Ti–Mn alloys on quenching from the beta field. The alloys containing aluminum are not subject to beta-prime formation, but the beta phase that is retained is mechanically unstable; that is, it transforms to martensite during straining. The best combinations of properties of alpha-beta alloys are obtained when there is a sufficient quantity of alpha phase in the structure to dissolve the alpha solutes. Strengths are lower in this condition than when transformation effects are involved, but ductility and toughness characteristics are generally very good. (For preceding report in series see NP-5374.) (auth)

1857

Battelle Memorial Inst.
THE EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM AND TITANIUM ALLOYS. SUMMARY REPORT. G. A. Lenning, C. M. Craighead, and R[obert] I. Jaffee. July 31, 1954. 100p. Contract DA-33-019-ORD-938. (NP-5474)

Results are given on the effect of notches, testing speed, and testing temperature on hydrogen embrittlement of high-purity titanium, commercial purity titanium (A-55), and the commercial 8% manganese alloy (C-110M). The effect of hydrogen on the microstructure and mechanical properties of alpha-beta and beta titanium–molybdenum alloys is presented. Hydrogen pickup of A-55 and C-110M titanium alloys in sodium hydride and Virgo descaling and acid pickling was also investigated. The removal of hydrogen by vacuum annealing of A-55 and C-110M titanium was studied. (auth)

1858

Crane Co.
RELAXATION BEHAVIOR OF TITANIUM ALLOYS. QUARTERLY PROGRESS REPORT NO. 2. E. A. Sticha. Oct. 15, 1954. 10p. Contract AF33(616)-2400. (NP-5496)

Progress on the study of relaxation behavior of Ti alloys was made to assist in the evaluation of the possible application of Ti alloys for bolting at elevated temperatures. (For preceding period see NP-5351.) (auth)

1859

Horizons, Inc.
RATE OF DIFFUSION OF CARBON IN ALPHA AND IN BETA TITANIUM AS A FUNCTION OF THE TEMPERATURE AND CONCENTRATION. FINAL TECHNICAL REPORT [FOR] PERIOD DECEMBER 12, 1952–JULY 1, 1954. Eugene Bucur and F. C. Wagner. Sept. 24, 1954. 73p. Contract DA-36-034-ORD-1157. (NP-5502)

The diffusion rates of carbon in titanium were determined over a range of temperature from 736 to 1150°C. The activation energies were obtained by application of the Arrhenius type equation, $D = D_0 \exp(-Q/RT)$, and from a logarithmic plot of the diffusion coefficients versus the reciprocal of the absolute temperature the values obtained for the alpha and beta temperature range are 43,500 and 48,400 cal/mole, respectively. The frequency factors obtained are: $D_0 = 5.06$ in the alpha range and $D_0 = 108$ in the beta range. By substituting the respective D_0 value and Q value for the alpha or beta temperature range in the Arrhenius type equation the diffusion coefficient for a specific temperature can be calculated directly. The scatter of results was somewhat greater in the β range than in the α range. However, a sufficient number of specimens were tested to obtain reliable average values of D at each temperature. It was also shown, within the limits of experimental error, that the rate of diffusion of carbon in titanium is independent of concentration, or at most, very slightly dependent on concentration. The solubility limits obtained for the alpha and beta temperature range are given. (auth)

1860

Arcos Corp.
THE WELDING OF TYPE 347 STEELS. THE EFFECT OF VARIOUS HEAT TREATMENTS ON THE NOTCHED BAR IMPACT PROPERTIES OF MODIFIED TYPE 347 WELD DEPOSITS. Lorin K. Poole. Nov. 8, 1954. 35p. Contract AT(30-1)-1233. (NYO-3498)

Impact properties of a standard partially ferritic Type 347 weld deposit were compared with four modified Type 347 and one Type 308L weld compositions. Fully austenitic Type 347 weld deposits are less susceptible to embrittlement when exposed to temperatures of 1100°F and 1300°F than are the standard partially ferritic compositions. Optimum room temperature impact toughness of all compositions is obtained after heat treatments at temperatures of 1700°F and higher. Impact tests at −320°F indicate that standard partially ferritic Type 347 weld deposits must be heat treated at 1950°F to assure a minimum of 15 ft. lbs. impact strength. This value cannot be attained by the fully austenitic Type 347 weld deposits in any of the post heat treatment conditions which were tried. Both at room temperature and at −320°F, Type 308L weld deposits show impact strengths superior to all other compositions tested, far exceeding 15 ft. lbs. except when heat treated in the temperature range of 1100 to 1300°F. (auth)

1861

Columbia Univ. School of Mines

THE STUDY OF DIFFUSIONLESS PHASE CHANGES IN SOLID METALS AND ALLOYS. FINAL REPORT FOR THE PERIOD JUNE 1, 1950 TO AUGUST 31, 1954. D. S. Lieberman. Aug. 31, 1954. 64p. Contract AT(30-1)-904. (NYO-3968; CU-20-54-AEC-904-Met.)

Several metal systems which exhibit a diffusionless phase transformation were investigated: AuCd, AgZn, InTl, FeNi, CuSn, Cu−Al−Ni, and $BaTiO_3$. Two AuCd alloys of 47.5 at.% Cd and 50 at.% Cd and an InTl alloy containing 20.75 at. % Tl were studied extensively. The Bridgman Method was modified to produce more perfect single crystal specimen and techniques for polishing and etching developed. X-ray, metallographic, optical goniometer, motion picture, interference fringe, dilometric, and visual studies were made of the effects of stress, temperature, previous history, and composition on the characteristics of the transformation and on the lattice parameters, elastic constants, electrical resistivity, density and stress-strain behavior, and other phenomena associated with the transformation. A new theory of diffusionless phase transformation was developed which permits the calculation of all of the important crystallographic features of the transformation from a knowledge only of the lattice parameter of the initial and final phases, and applied to the austenite-martensite reaction in iron-base alloys in addition to the AuCd and InTl alloys. The fundamental physical ideas upon which this theory are based and an outline of the mathematical analysis is presented. The nature of this type of transformation, the interactions of imperfections, and the processes governing relaxation and stabilization phenomena is discussed. (auth)

1862

Laboratories for Research and Development, Franklin Inst.

TECHNICAL PROGRESS REPORT [ON THE STRUCTURE AND PROPERTIES OF IRON POWDERS PREPARED BY THE CARBONYL PROCESS]. Dec. 1954. 21p. Contract AT(30-1)-1484. (NYO-6114)

The behavior of iron powders prepared by the carbonyl process has been studied as a function of time and temperature of annealing. The strain and crystallite size present in the powder were determined by x-ray-diffraction techniques. It was found that the strain is substantially reduced before crystal growth occurs. The activation energy for the recovery process was found to be approximately 20 kcal/mole, and the activation energy for crystal growth was found to be approximately 46 kcal/mole. Precipitation of Fe_4N occurred for low temperatures and short times of anneal, with the precipitate size increasing with time of anneal. The maximum relative amount of Fe_4N precipitates of measurable size present is about the same for all temperatures below 450°C, with this amount being reached sooner at higher temperatures. The magnetic coercive force was measured and found to be strongly correlated with the size of the iron crystallites. (auth)

1863

RAND Corp.

GRÜNEISEN'S CONSTANT FOR SOME METALS. J. J. Gilvarry. June 24, 1954. 13p. For Radiation Lab., Univ. of Calif., Berkeley. Contract [W-7405-eng-48], Subcontract 64. (AECU-2996; P-540-AEC)

The Grüneisen constants, as evaluated from compressibility parameters, are redetermined for the alkali metals Li, Na, and K and for Rb and Cs and are shown to be in good agreement with the corresponding values of the Grüneisen constants as evaluated from Grüneisen's law. In the cases of Mn, Mo, Ta, and Au, previous work by Slater (Phys. Rev. 57, 744(1940)) had shown a large discrepancy between these two evaluations of the Grüneisen constant. The discrepancy is largely removed for Mn and Au by a redetermination of the Grüneisen constant from more recent compressibility data of Bridgman. The disagreement persists for Mo (to some degree), and for Ta (where the disparity is large). A similar redetermination for Al brings closer agreement than previous between the two evaluations of the constant. (auth)

1864

General Electric Research Lab.

FUNDAMENTAL RESEARCH IN PHYSICAL METALLURGY. TWENTY-FOURTH QUARTERLY REPORT. (PROGRESS REPORT NO. 41). J. H. Hollomon and D[avid] Turnbull. Jan. 5, 1955. 6p. Contract W-31-109-Eng-52. (SO-2037; RL-1237)

Further results on the anisotropy of the grain-boundary diffusion coefficients in silver bicrystals are reported. A program for investigating the heat capacity of certain alloy systems at low temperatures is outlined. (auth)

1865

A NEW METHOD FOR POLISHING AND ETCHING OF METALLOGRAPHIC SPECIMENS OF TUNGSTEN AND MOLYBDENUM METAL. T. Millner and L. Sass. Translated from Aluminum Budapest 5, p. 214-15 (1953). 5p. Available from Henry Brutcher (Trans. No. 3281), Altadena, Calif. (AEC-tr-1995)

A study on an etching solution for developing the grain boundaries of metallographic specimens of tungsten in the recrystallized as well as wrought state and the advantages of the solution over the currently used etchants are reported. Reduction of polishing time to one-tenth of the time hitherto needed by making certain additions to alumina suspension was made. Results obtained with the use of the same solution (but in a different quantity) in the etching and polishing of molybdenum metal are given. (auth)

1866

ON THE STRUCTURE OF THE CARBIDE PHASES OF VANADIUM. M. A. Gurevich and B. F. Ormont. Trans-

lated from Doklady Akad. Nauk S.S.S.R. 96, 1165-8(1954). 8p. Available from Henry Brutcher (Trans. No. 3414), Altadena, Calif. (AEC-tr-1998)

1867

A NEW CRITERION OF BRITTLENESS AND PLASTICITY OF METALS. G. V. Uzhik. Translated from Doklady Akad. Nauk. S.S.S.R. 68, 1037-9(1949). 4p. Available from Henry Brutcher (Trans. No. 2907), Altadena, Calif. (AEC-tr-1999)

A new quantitative index for brittleness and plasticity of metals in the form of the ratio of cleavage stress to shear stress is reported. Mathematics underlying the new index and confirming its validity is developed. The relationships involved are represented diagrammatically. (L.T.W.)

1868

THE ELECTRICAL FIELD WITHIN THE PASSIVE FILM OF IRON. Klaus J. Vetter. Translated by F. Hudswell from Z. Elektrochem. 58, 230-7(1954). 13p. (AERE-Lib/Trans-449)

The existence of a potential difference within a passive noncorroding film on iron has been confirmed. The potential difference is of the order of magnitude of 1 volt and causes the migration of ions through the film as indicated by the d-c conductivity of the film. The investigations confirming these results are described. (M.P.G.)

1869

THE INFLUENCE OF COBALT UPON THE DIFFUSION OF CARBON IN IRON–CARBON ALLOYS. V. A. Yurkov and M. A. Krishtal. Translated by V. Beak from Doklady Akad. Nauk S.S.S.R. 92, 1171-3(1953). 3p. (AERE-Lib/Trans-465)

The diffusion coefficient of C in Fe alloyed with 4% C and 1, 3, 4, and 5% Co was measured. The coefficient proved to be an oscillating function of the Co concentration, with minimum values corresponding to 1 and 4% Co content. This result is ascribed to changes in the interatomic bonds in the lattice of the Fe system. The electrolytic difference of potential between Fe and the Fe–C–Co system was found to vary with Co content in a manner similar to the diffusion coefficient. It is suggested that this may be a result of the formation of stable atomic groupings with localized electronic bonds. Since the process of diffusion of C occurs in austenite, it is supposed that the main quantity of Co is contained in the austenite. (M.P.G.)

1870

STRUCTURE AND PROPERTIES OF Ti–C ALLOYS. H. R. Ogden, R. I. Jaffee, and F. C. Holden (Battelle Memorial Inst., Columbus, Ohio). J. Metals 7, 73-80(1955) Jan.

The mechanical properties of Ti-C and Ti-C-O alloys can be altered by heat treatments to dissolve or reject carbon from solid solutions. The maximum strength is obtained by annealing just below the peritectoid temperature. Quenching from the β-carbide field results in softening. Impact behavior is influenced by the extent of solution of interstitials. (auth)

1871

SOLUTION RATE OF SOLID ALUMINUM IN MOLTEN Al–Si ALLOY. C. M. Craighead, E. W. Cawthorne, and R. I. Jaffee (Battelle Memorial Inst., Columbus, Ohio). J. Metals 7, 81-7(1955) Jan.

Quantitative solution rates for the solution of 2S Al and some Al alloys in molten Al–Si were obtained for a number of operating conditions. Static tests conducted at 585, 595, 600, 610, and 625°C for baths containing 10.5, 11.8, 12.5 and 14% Si show a linear relation between the time of immersion at a constant temperature and the depth of penetration. The effect of agitation was studied using an eutectic Al–bath at 585 and 600°C. (J.E.D.)

1872

TITANIUM–LEAD SYSTEM. Paul Farrar and Harold Margolin (New York Univ., New York). J. Metals 7, 101-4 (1955) Jan.

The Ti–Pb diagram was investigated in the region 0 to 58% Pb and from 500°C to liquidus temperatures. Three reactions were encountered: $1-\beta \rightarrow \alpha + Ti_4Pb$ at 725 ± 10°C; $2-\beta + L \rightarrow Ti_4Pb$ at 1305 ± 10°C; and 3–the possible eutectic $L \rightarrow Ti_4Pb$ and γ between 1200 and 1300°C. (auth)

1873

EFFECT OF ALPHA SOLUTES ON THE HEAT-TREATMENT RESPONSE OF Ti–Mn ALLOYS. H. R. Ogden, F. C. Holden, and R. I. Jaffee (Battelle Memorial Inst., Columbus, Ohio). J. Metals 7, 105-12(1955) Jan.

Alpha solutes increase the strengths of Ti–Mn alloys through solid-solution strengthening. The substitutional α addition, aluminum, decreases, and the interstitial solutes, carbon and nitrogen, increase the rate of nucleation and growth of α from β. The best combinations of properties of α-β alloys are obtained when there is a sufficient quantity of α phase in the structure to dissolve the α solutes. (auth)

1874

SELECTED ISOTHERMAL SECTIONS IN THE TITANIUM-RICH CORNERS OF THE SYSTEMS Ti–Fe–O, Ti–Cr–O, AND Ti–Ni–O. W. Rostoker (Armour Research Foundation, Chicago, Ill.). J. Metals 7, 113-16(1955) Jan.

Single isothermal sections were constructed for the titanium-rich corners of the systems Ti–Fe–O, Ti–Cr–O, and Ti–Ni–O with a view to locating the shape and disposition of the ternary intermediate-phase fields for the compounds isomorphous with Fe_3W_3C. (auth)

1875

HEAT TREATMENT AND MECHANICAL PROPERTIES OF Ti–Cu ALLOYS. F. C. Holden, A. A. Watts, H. R. Ogden, and R. I. Jaffee (Battelle Memorial Inst., Columbus, Ohio). J. Metals 7, 117-25(1955) Jan.

Hypoeutectoid Ti–Cu alloys are responsive to heat treatment, and considerable variation of mechanical properties may be produced by transformation of the β phase. Control of cooling rate, isothermal transformation, or quench tempering determine the transformation structure and properties. The transformation products are similar to those of carbon steel. (auth)

1876

CHROMIUM-RICH PORTION OF THE CHROMIUM–NICKEL PHASE DIAGRAM. Charles Stein and Nicholas J. Grant (Massachusetts Inst. of Tech., Cambridge). J. Metals 7, 127-34(1955) Jan.

A more complete determination of the chromium-rich portion of the Cr–Ni phase diagram was made, based in part on resistivity measurements. The existence of a eutectoid reaction at 1215°C, in addition to the previously reported eutectic reaction at 1343°C, was confirmed. Metallographic studies, lineal analysis, and diffusion-couple evidence were utilized to support and extend the findings of

the resistivity measurements. Delineation of the α chromium solvus line shows that the maximum solubility of nickel in α chromium decreases rapidly from 25 wt. % Ni at the eutectoid temperature to 16 wt. % Ni at 950°C. (auth)

1877

SOLUBILITY AND DECOMPOSITION PRESSURES OF HYDROGEN IN ALPHA-ZIRCONIUM. Earl A. Gulbransen and Kenneth F. Andrew (Westinghouse Electric Corp, East Pittsburgh, Penna.). J. Metals 7, 136-44(1955) Jan.

Thermodynamic information on the solubility of hydrogen in exothermic metals is limited. Thus, the over-all solubility decreased as the temperature rose, which suggests the heat of solution of hydrogen in the metal is negative; yet the terminal solubility in the metal phase increased, which suggests an endothermic reaction. A thermodynamic analysis, therefore, was made of the several equilibria involved when hydrogen dissolved in the metal. Equations were derived expressing the solubility, terminal solubility, and decomposition pressures of hydrogen in terms of the heat, entropy, and free energy of solution of hydrogen in the given phase. The relations between the thermodynamic functions for the α-zirconium and δ-hydride phase were developed. The thermodynamic quantities were determined experimentally by the measurement of the decomposition pressures over a broad composition and temperature range. Two new methods of analyzing the experimental data were developed for determination of the terminal solubility. (auth)

1878

RESISTANCE SINTERING UNDER PRESSURE. F. V. Lenel (Rensselaer Polytechnic Inst., Troy, N. Y.). J. Metals 7, 158-67(1955) Jan.

Resistance sintering under pressure is a method of hot pressing in which a powder compact is subjected to pressure and simultaneously heated by passing a low voltage high amperage current through it. Equipment for this process is described. Its basic characteristics such as resistance requirements for powders and compacts, temperature distribution in compacts, and gas reactions during resistance sintering are discussed. Examples of the sintering process in compacts made of a single metal or an alloy powder and in compacts made of mixtures of powders are presented. Potential commercial applications of the process are evaluated. (auth)

1879

THERMAL CONDUCTIVITY OF URANIUM AND SEVERAL URANIUM ALLOYS. James L. Weeks (Argonne National Lab., Lemont, Ill.). J. Metals 7, 192(1955) Jan.

The thermal conductivities of U and C–U, Cr–U, and U–Zr alloys at 70°C are reported. (J.E.D.)

1880

PROTECTION OF TITANIUM METAL AGAINST EMBRITTLEMENT. Herbert R. Toler, Jr. (Univ. of Illinois, Urbana). Bull. Am. Ceram. Soc. 34, 4-8(1955) Jan.

The rates of embrittlement for commercially pure titanium in atmospheres of hydrogen, oxygen, nitrogen, and air were studied. The results indicated that hydrogen was the major source of embrittlement. The presence of moisture in either nitrogen or air considerably reduced the impact resistance of the metal. The rate of embrittlement at 1500°F was retarded approximately threefold by a vacuum-processed ceramic coating. (auth)

1881

ON A TYPE OF SPIRAL SUB-STRUCTURE IN A β-γ BRASS CONTAINING ALUMINUM. Pierre A. Jacquet. Compt. rend. 239, 1799-1801(1954) Dec. 20. (In French)

The electrolytic polishing of a β brass with large grains, containing 3.99% Al, cast and then tempered, shows a form, other than the precipitation in the γ phase, comparable to those found on the growth faces of mineral crystals. In particular, these forms are spirals. (tr-auth)

1882

AN INTERPRETATION OF SPIRAL SUB-STRUCTURES OBSERVED IN A β-γ BRASS CONTAINING ALUMINUM. Adrienne R. Weill and Pierre A. Jacquet. Compt. rend. 239, 1801-3(1954) Dec. 20. (In French)

The spirals observed in the β brass result, like other marks, from a precipitation obeying a mechanism imposed by the rearrangement of atoms in solution and of dislocations. (tr-auth)

1883

DETERMINATION OF THE VAPOR TENSION OF METALS WITH RADIOACTIVE ISOTOPES. M. V. Smirnov and S. P. Detknov. Doklady Akad. Nauk S.S.S.R. 98, 777-80(1954) Oct. 11.

A dynamic method of measuring the vapor pressure of metals with γ-emitting isotopes, in which the metal vapor flowing through a tube from a retort is measured radiometrically, is described. Data on the vapor pressure of Zn from 554 to 904.2°C are presented. (G.Y.)

1884

EFFECT OF MANGANESE ON SELF-DIFFUSION IN IRON. P. L. Gruzin, B. M. Noskov, and V. I. Shirokov. Doklady Akad. Nauk S.S.S.R. 99, 247-50(1954) Nov. 11. (In Russian)

The temperature coefficient of self-diffusion was studied in Fe–Mn alloys (0.40 to 8.23 Mn, 0.02 to 0.035 C, 0 to 0.07 Si, 0.013 to 0.049 S, 0.09 to 0.33 wt. % Ni) over the temperature range 950 to 1350°C by the use of Fe^{59} tracer. (G.Y.)

1885

CORROSION OF STAINLESS STEEL IN ACID OXIDIZING SOLUTIONS; NEW TYPE OF CORROSIVE ATTACK ON WELDED JOINTS. M. M. Kurtepov (Inst. of Physical Chemistry, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 99, 305-7(1954) Nov. 11. (In Russian)

Corrosion of welded stainless and acid-resisting steel after prolonged exposure to HNO_3 – $K_2Cr_2O_7$ solution at 100°C is illustrated. An intercrystalline type of corrosion in welded 18-8 stabilized with Ti, Nb, Mo, Ti + Mo, or Nb + Mo is shown. 2 figures. (G.Y.)

1886

HIGH-TEMPERATURE ALLOY BRAZING OF THIN MATERIALS FOR JET ENGINES. Arnold S. Rose and William N. Lewis (I-T-E Circuit Breaker Co., Philadelphia, Penna.). Welding J. (N. Y.) 34, 30-9(1955) Jan.

The high temperature, BNiCr braze alloy has been found to have many applications in the fabrication of jet engine components, particularly in the assembly of thin sheet materials. With these, several aspects of the BNiCr properties require consideration in order to enable its successful usage. The relatively wide solidus-liquidus range between 1850 and 1950° F and the erosive penetration and alloying of the parent materials by the brazing material are of prime importance. Techniques have been established which minimize to a large extent the drastic loss of strength accompanying extensive alloying with the base metals, involving strategic braze alloy placement and full utilization of capillarity for joint filling. In addition, the hazard of slow heating

through the melting range has been demonstrated and the requirement for fast heating through this solidus-liquidus range has been emphasized. (auth)

1887

BLISTERING AND EMBRITTLEMENT OF PRESSURE VESSEL STEELS BY HYDROGEN. G. A. Nelson and R. T. Effinger. Welding J. (N. Y.) 34, 12s-21s(1955) Jan.

The nature of the damaging effects of hydrogen on pressure vessel steels varies with temperature and other factors, particularly the presence of certain corrosives. At high temperatures and pressures, atomic hydrogen from thermal dissociation causes decarburization and general intergranular cracking. At low temperature, diffusion of atomic hydrogen produced by corrosion leads to blisters and isolated cracks (without decarburization). This is brought about by recombination within the metal to molecular hydrogen, which does not readily diffuse through the metal and accordingly builds up high internal pressures. Precautions to be taken against damage of both of these kinds are outlined for use in design, construction, and operation of pressure vessels. (auth)

1888

STAINLESS STEELS—WELDING SUMMARY. Helmut Thielsch (Grinnell Co., Providence, R. I.). Welding J. (N. Y.) 34, 22s-30s(1955) Jan.

A study was made of the effects of alloying and residual elements and welding characteristics of commercial austenitic, martensitic, and ferric stainless steel. (auth)

1889

STUDIES OF THE BIAXIAL FATIGUE PROPERTIES OF PRESSURE VESSEL STEELS. C. E. Bowman and T. J. Dolan (Univ. of Illinois, Urbana). Welding J. (N. Y.) 34, 51s-9s(1955) Jan.

An evaluation of the effects of welding, notches, attachments, and other fabrication operations upon the resistance of pressure vessel steels to repeated loading is presented. The results are compared to previously reported studies of similar 10 × 17 in. specimens of the same steels. (auth)

1890

A TURBINE-BLADE ALLOY CASTABLE AND LOW IN COBALT AND COLUMBIUM. W. Siegfried and F. Elsermann (Sulzer Bros., Ltd., Winterthur, Switzerland). Metal Progr. 67, No. 1, 141-6(1955) Jan.

An outline of the work to discover a superalloy capable of investment casting (mass production) and economical in scarce alloy metals (Co and Nb) is presented. Results of creep and rupture tests on alloys with Ni–Br–Fe and Ni–Mn–Co–Cr–Fe matrices with small matrices with small amounts of N and C and small additions of W, V, Mo, and Nb are presented. Thermal shock tests on the cast blades are discussed, and results indicate that they are no more susceptible than the forged blades now used in gas turbines. (J.A.G.)

1891

NEW HEAT TREATING EQUIPMENT IN GREAT BRITAIN. Tom Bishop. Metal Progr. 67, No. 1, 154-8(1955) Jan.

Equipment and processes for the continuous annealing of Al foil without crinkling, heat treating of clad Al alloy sheet in molten $NaNO_3$ baths without staining by the control of free alkali, continuous flash annealing of Al and Al alloy, heat treatment of Be–Cu components for aircraft in a 60-kev horizontal furnace by forced-air circulation, and a sintering and annealing furnace for powder metals are described. A drip-feed liquid for generating a carburizing atmosphere, scale-free heating, and vibrator-tube furnaces for continuous hardening of small components for the heat treatment of steel are described. (J.A.G.)

1892

TITANIUM AND TITANIUM ALLOYS. John L. Everhart. New York, Reinhold Publishing Corp., 1954. 184p.

High purity Ti, properties of commercial Ti and Ti alloys, heat treatment, forming and fabricating, joining, machining and grinding, and cleaning and finishing are the topics discussed in this book on Ti. (J.E.D.)

PHYSICS

1893

David Sarnoff Research Center

ELECTRONIC DEVICES FOR NUCLEAR PHYSICS. QUARTERLY REPORT NO. 16, MAY 1, 1954–JULY 31, 1954. R. H. Anderson, M. H. Greenblatt, and A. H. Sommer. This report also covers work on photoelectric emission which is not included in the contract, and was done by: A. L. Solomon and A. H. Sommer. Aug. 25, 1954. 20p. For [Oak Ridge National Lab.]. Contract W-7405-eng-26, Subcontract 308. (AECU-2949)

Work on new photocathodes and an analysis of cathode materials by chemical and x-ray-diffraction methods was continued. Sb analysis for Sb-multi-alkali cathodes was carried out by colorimetric microanalysis. The crystal structure of K_3Sb, Rb_3Sb, and Cs_3Sb was studied by x-ray diffraction. A photomultiplier tube with a 300-cm^2 photocathode was tested for optimum performance. A high-output current photomultiplier tube is being constructed with strong electrostatic fields near the last few dynodes where space-charge limitation has occurred. (For preceding report in series see AECU-2920.) (K.S.)

1894

INVESTIGATIONS ON THE ZIRCONIUM-LIGHT. J. A. M. van Liempt and J. A. de Vriend. Translated by K. Roos from Rec. trav. chim. 53, 895-8(1934). 8p. (ATI-103581)

The light produced by the combustion of Zr in O has been studied. It was found that the amount of light produced was directly proportional to the weight of the Zr. The duration of the flash was proportional to the thickness of the Zr wire and was relatively longer from Zr tape than from wire of equal cross section. The combustion of Zr occurs more slowly than that of Mg. The spectrum of Zr light is continuous. Its photographic color rendering is superior to that of daylight and almost equal to that of Mg. The absolute output of Zr light is 36 lumens per w. (M.P.G.)

1895

Bureau of Mines. Eastern Experimental Station

SOME ASPECTS OF THE ELECTRODEPOSITION OF TITANIUM AND ZIRCONIUM COATINGS. R[obert] M. Creamer, D[avid] H. Chambers, and C[harles] E. White. Dec. 1954. 41p. [Part of work was conducted under Contract AF33(038)-50-1085]. (BM-RI-5093)

Attempts were made to electroplate titanium and zirconium from aqueous, nonaqueous, and fused-salt electrolytes. Metals were produced only in fused-salt electrolytes, the major product being sponge metal. All other electrolytes

gave only partial reduction of the metal ions. Fused alkali borate electrolytes containing titanium salts gave titanium boride powders and coatings of poor adherence. Some of the problems encountered in the deposition of these metals and some of the aspects of titanium and zirconium chemistry involved are discussed. (auth)

1896

Los Alamos Scientific Lab.
VALUES OF THERMODYNAMIC FUNCTIONS TO 12,000°K FOR SEVERAL SUBSTANCES. W. Fickett and Robert D. Cowan. Sept. 1, 1954. 21p. Contract W-7405-eng-36. (LA-1727)

Approximate values of energy and entropy have been calculated over the range of 3,000 to 12,000°K for the following substances in their standard states: H_2, CO, N_2, NO, O_2, C_2, CO_2, H_2O, C(graphite). These have been adjusted to join smoothly onto the data published by the National Bureau of Standards, which extend only to 5,000°K. Least-squares fits of these functions have been made for the ranges 500 to 3,000°K and 3,000 to 12,000°K. (auth)

1897

Mine Safety Appliances Co.
MONTHLY REPORT NO. 1, JULY 1953, TO DETROIT EDISON COMPANY. Aug. 11, 1953. 10p. (NP-5477)

Corrosion tests with liquid Na on a group of special fuel alloy test specimens are conducted in two corrosion harps. The design of the harps is emphasized. (K.S.)

1898

Mine Safety Appliances Co.
MONTHLY REPORT NO. 2, OCTOBER 1953, TO DETROIT EDISON COMPANY. Nov. 2, 1953. 19p. (NP-5478)

Final corrosion loop design is presented for the study of liquid-Na corrosive effects. (K.S.)

1899

Mine Safety Appliances Co.
MONTHLY REPORT NO. 3, NOVEMBER 1953, TO DETROIT EDISON COMPANY. [Dec.] 1953. 16p. (NP-5479)

Completion of the liquid-Na corrosion test loop is reported. Initial procedures for starting test runs on globeiron samples were established. (K.S.)

1900

Mine Safety Appliances Co.
MONTHLY REPORT NO. 4, DECEMBER 1953, TO DETROIT EDISON COMPANY. Jan. 4, 1954. 12p. (NP-5480)

Initial operation of a corrosion loop for testing the corrosive effects of liquid Na on samples of globeiron tubing are described. The thermal and hydrodynamic characteristics of the loop system were determined. (K.S.)

1901

Mine Safety Appliances Co.
MONTHLY REPORT NO. 5, JANUARY 1954, TO DETROIT EDISON COMPANY. R. H. Jones. Feb. 16, 1954. 18p. (NP-5481)

Test results are evaluated for a 7-day run on the corrosion of globeiron tubing by liquid Na. A slight grain growth was the only indicated change in the material. (K.S.)

1902

Mine Safety Appliances Co.
MONTHLY REPORT NO. 6, FEBRUARY 1954, TO DETROIT EDISON COMPANY. R. H. Jones. Mar. 11, 1954. 21p. (NP-5482)

Test results are evaluated for a 30-day run on the corrosion of globeiron tubing by liquid Na. A slight grain growth was the only indicated change in the material. (K.S.)

1903

Mine Safety Appliances Co.
REPORT NO. 8, MAY 8, 1954 TO JULY 1, 1954, TO DETROIT EDISON COMPANY. J. R. Taylor, S[heridan] J. Rodgers, and H. J. Williams. Sept. 10, 1954. 38p. (NP-5483)

A detailed analysis was made of globeiron tubing exposed for 30 days in a liquid Na corrosion loop. Parts of the loop and samples of Na were examined in order to estimate the effects of corrosion. (K.S.)

1904

Mine Safety Appliances Co.
REPORT NO. 9, JULY 1, 1954 TO SEPTEMBER 1, 1954, TO DETROIT EDISON COMPANY. J. R. Taylor, S[heridan] J. Rodgers, and H. J. Williams. Sept. 30, 1954. 26p. (NP-5484)

Liquid sodium corrosion tests are described for two Ti tube specimens. Both specimens failed by oxide formation along grain boundaries with erosion of TiO_2 at the hot end of the corrosion loop where turbulence was greatest. O_2 was absorbed from the liquid Na and NaK. (K.S.)

1905

Institute for the Study of Rate Processes, Univ. of Utah
MECHANISM OF DETONATION. TECHNICAL REPORT NO. 41. M[elvin] A. Cook. Nov. 15, 1954. 37p. Contract N7-onr-45107. (NP-5493)

The requirements of the laws of conservation of energy and reaction kinetics are applied in an investigation of the validity of the "jump condition" of the Zeldovich-von Neumann theory in gaseous explosives. It is shown that this jump condition apparently is not a satisfactory solution but that pressures in the reaction zone are limited to values no greater than the pressure p_1 at the end of the chemical reaction zone (except possibly for an extremely short distance of perhaps several mean-free paths at the extreme front where thermal equilibrium may not exist). Arguments are then presented indicating that the pressure = p_1 throughout the reaction zone. This condition requires high thermal conductivity in the reaction zone. Experimental evidence is presented indicating that this may indeed be true. (auth)

1906

VAPOUR PRESSURES OF He^3-He^4 MIXTURES. S. M. Bhagat and P. K. Katti (Univ. of Delhi, India). Progr. Theoret. Phys. (Japan) 12, 380-2(1954) Sept.

1907

PRESSURE-VOLUME ISOTHERMS OF He^4 BELOW 4.2°K. William E. Keller (Los Alamos Scientific Lab., New Mex.). Phys. Rev. 97, 1-8(1955) Jan. 1.

A description is presented of a new apparatus for obtaining PV isotherms at very low temperatures, along with results of measurements on five isotherms at 3.961, 3.348, 2.862, 2.324, and 2.154°K for He^4 gas; the second virial coefficients, B, at these respective temperatures were found to be −83.70, −103.4, −123.6, −157.7, and −176.4 cc/mole. The reliability of previous data as well as of the several analytical treatments of the data is discussed, the conclu-

sion being with respect to the latter that the He^4 isotherms below 4°K can be best represented by the equation $PV/N = RT(1 + BN/V)$. When both the previous and the present data are analyzed in this way, a consistent set of values for B is obtained. From the values of RT measured here, corrections to the 1948 temperature scale are obtained in good agreement with modifications suggested by other authors. (auth)

1908

SECOND VIRIAL COEFFICIENTS OF HELIUM FROM THE EXP-SIX POTENTIAL. John E. Kilpatrick, William E. Keller, and Edward F. Hammel (Los Alamos Scientific Lab., New Mex.). Phys. Rev. 97, 9-12(1955) Jan. 1.

A set of potential constants for the He-He exp-six intermolecular potential has been found which leads to calculated results in good agreement with the experimental second virial coefficients of He^4 both at high and at low temperatures with the high-temperature viscosity and thermal conductivity data. A table of the second virial coefficients of He^3 and He^4 over the temperature range 0.3°K to 60°K is given. The position of a negative discrete energy as a function of some of the parameters of the exp-six potential has been investigated. (auth)

1909

ENERGIES OF THE K TRANSITIONS OF π^- MESONIC X-RAYS. M. Stearns, M. B. Stearns, S. DeBenedetti, and L. Leipuner (Carnegie Inst. of Tech., Pittsburgh, Penna.). Phys. Rev. 97, 240-2(1955) Jan. 1.

Measurements of K-transition energy shifts in Be, C, N, O, and F are reported. (L.T.W.)

1910

ANALYSIS OF THE PHENOMENON OF FORMATION OF MONOCHROMATIC POSITRONS. L. A. Sliv. Zhur. Ekspti'. i Teoret. Fiz. 25, No. 1, 7-18(1953). (In Russian)

Monochromatic positrons can be formed by a nuclear transition with pair formation (the cases of formation from electric dipole and quadrupole and magnetic quadrupole radiation from the nucleus and of pair-production accompanying a 0–0 transitions are calculated) in which case the electron must be formed in an unfilled state of the screening electrons if monochromatic positrons are to be formed. These positrons can be labelled as K, L, etc., positrons corresponding to electron formation in the K, L, etc. levels. For this process to take place, one of the electron states must be empty. This might take place (a) in a nuclear transition by γ cascade, where one of the γ rays ionizes the nucleus and another forms the pair, or (b) after K capture, if the transition of the excited nucleus releases enough energy to produce pairs. Conversion coefficients for formation of K, L, etc., positrons are given. (Science Abstracts)

1911

THERMOELECTRIC PROPERTIES OF ALKALINE METAL SOLUTIONS IN LIQUID AMMONIA. Jacob F. Dewald and Gerard Lepoutre. J. chim. phys. 51, 281(1954) May. (In French)

The thermoelectric properties of Na and K in a liquid ammonia solution have been studied at various concentrations and temperatures. It was found that the negative ions in these solutions were electrons. The experimental curve of thermoelectric power as a function of the concentration shows an anomaly with theory for dilute solutions. (K.S.)

AEROSOLS

1912

Polytechnic Inst. of Brooklyn

THEORETICAL INVESTIGATION OF THE GROWTH OF AEROSOL PARTICLES BY DIFFUSION. SCIENTIFIC REPORT NO. 2. H. L. Frisch and F. C. Collins. [1952?]. 16p. Contract AF19(122)-412. (AD-32611)

The growth rate and radius of an aerosol particle in a turbulent supersaturated fluid is calculated on the basis of a simple "stagnant film" model, in the presence of time-dependent, homogeneously distributed sources in the diffusion field. The limiting growth law leads to a three-halves power dependence of the radius upon the time. The collapse of the supersaturation due to competition for molecules of the diffusing species among an initially monodisperse, homogeneous and radom distribution of aerosol particles leads to an asymptotic in time final limiting critical radius. The critical radius attained is equal to the corresponding critical radius of an aerosol particle growing in a fluid at rest in an infinite volume. The distribution of initially monodisperse aerosol particles remains monodisperse throughout the growth process. The application of the theory to the growth of water droplets in a turbulent cloud is indicated. (auth)

1913

MONITORING FOR TOXIC DUSTS AND FUMES. A. H. C. P. Gillieson (Atomic Energy Research Establishment, Harwell, Berks, England). Atomics 6, 15-18(1955) Jan.

The direct spectrographic monitoring of toxic inorganic dusts and fumes in factory atmospheres is discussed with especial reference to beryllium aerosols. (auth)

ASTROPHYSICS

1914

THE NEUTRINO AND THE FORMATION OF TECHNETIUM IN CERTAIN STARS. Maurice E. Nahmias. Compt. rend. 239, 1595-7(1954) Dec. 8. (In French)

A way is suggested for producing certain elements in stars, particularly Tc^{99}, a β emitter of 2.12×10^5-yr half life, by a closed cycle involving neutrinos of energy greater than 1.8 Mev emitted by other astronuclear reactions. The suggested schemes are $Ru^{99} + \nu \rightarrow Tc^{99} + \beta^+$, and $Tc^{99} \rightarrow Ru^{99} + \beta^- + \nu$. (tr-auth)

1915

AGE OF METEORITES BY THE A^{40}–K^{40} METHOD. G. J. Wasserburg (Univ. of Chicago, Ill.) and R. J. Hayden (Argonne National Lab., Lemont, Ill.). Phys. Rev. 97, 86-7 (1955) Jan. 1.

The ages of two stony meteorites were determined by measuring the A^{40}/K^{40} ratio using an isotopic dilution technique. With a branching ratio $\lambda_e/\lambda_\beta = 0.085$ and a decay constant $\lambda = 0.55 \times 10^{-9}$ yr^{-1}, the ages obtained were $(4.82 \pm 0.20) \times 10^9$ and $(4.58 \pm 0.20) \times 10^9$ years. (auth)

1916

NEUTRINOS FROM THE SUN. A. M. Cormack (Univ. of Cape Town, Rondebosch, Cape, South Africa). Phys. Rev. 97, 137-9(1955) Jan. 1.

The carbon cycle in the sun causes a large flux of neutrinos at the earth. The heat generated by these in the earth is calculated as a function of the neutrino magnetic moment. It is shown that this heat production is small compared to that resulting from the natural radioactivity of the core,

that practically all of the carbon cycle energy liberated in the form of neutrinos in the sun is lost by the sun, and that the energy distribution of the neutrinos reaching the earth is practically the same as their energy distribution on creation in the sun. (auth)

COSMIC RADIATION

1917

EAST-WEST ASYMMETRY AND ANGULAR DISTRIBUTION OF PROTONS AND MESONS. N. N. Kocharyan, M. T. Aivazyan, S. D. Kaitmazov, and Z. A. Kirakosyan. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 364-7(1953). (In Russian)

Protons at 3200 m of $p > 9 \times 10^9$ ev are stopped in lead and copper blocks and show an angular distribution $N = N_0 \cos^n \theta$ with $n = 6.3 \pm 1.4$, but no east-west effect. A significant east-west asymmetry for mesons is observed. (Science Abstracts)

1918

ON THE MASS SPECTRA OF COSMIC RAY PARTICLES AT SEA LEVEL. A. I. Alikhanov and G. P. Eliseev. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 368-78(1953). (In Russian)

A magnetic mass spectrograph is described. The particle momentum is fixed by five successive trays of counters and the particle is brought to rest by laminar absorbers. The apparatus allows resolution of the π and μ spectra. Measurements show masses intermediate between π and μ proton masses and a few masses greater than the latter. (Science Abstracts)

1919

STUDIES ON THE THEORY OF CASCADES. I. L. Yanoshi (Central Physics Research Inst., Budapest). Zhur. Eksptl'. i Teoret. Fiz. 26, 386-404(1954) Apr. (In Russian)

Detailed derivations of equations for the generating functions of cascade theory are given. (G.Y.)

1920

CHERENKOV RADIATION BY COSMIC PARTICLES IN THE ATMOSPHERE. V. I. Gol'danskii and G. B. Zhdanov (Lebedev Physics Inst., Academy of Sciences, U.S.S.R.). Zhur. Eksptl'. i Teoret. Fiz. 26, 405-16(1954) Apr. (In Russian)

1921

INFLUENCE OF METEOROLOGICAL FACTORS ON THE COSMIC RADIATION HARD COMPONENT LATITUDINAL EFFECT AND THE MESON PRODUCTION PROCESS. L. I. Dorman (Research Inst. of Terrestrial Magnetism). Zhur. Eksptl'. i Teoret. Fiz. 26, 504-5(1954) Apr. (In Russian)

1922

ABSORPTION RANGE OF NUCLEONS IN LEAD. N. M. Kocharyan (Physics Institute, Academy of Sciences, Armenian S.S.S.R.). Doklady Akad. Nauk S.S.S.R. 98, 369-72 (1954) Sept. 21. (In Russian)

Magnetic spectrometer studies are reported in which the absorption range for protons with momenta ≥ 1 Bev/c is found to be 315 ± 36 g/cm^2. (G.Y.)

1923

ON THE ORIGIN OF COSMIC RADIATION. V. L. Ginzburg (Lebedev Physics Inst., Akademy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 99, 703-6(1954) Dec. 11. (In Russian)

1924

ON THE LOSS OF ENERGY BY IONIZATION OF THE NUCLEAR COMPONENT IN THE ATMOSPHERE. Tsai-Chu and Max Morand. Compt. rend. 239, 1786-8(1954) Dec. 20. (In French)

The loss of energy of the nuclear component of cosmic radiation by ionization is calculated from the moment spectrum. The value, at a latitude of 50°, is about 120 Mev/cm^2/sec/sterad, and is larger than that estimated by Rossi. (K.S.)

1925

MEAN FREE PATH FOR SHOWER PRODUCTION BY HIGH-ENERGY Pi MESONS. Fritz E. Froehlich and Kurt Sitte (Syracuse Univ., N. Y.). Phys. Rev. 97, 151-9(1955) Jan. 1.

In order to investigate a possible difference in the mean free paths for shower production by protons and by π mesons of very high energy, an experiment was carried out at Echo Lake, Colorado (altitude 3260 m) in which the rate of production of penetrating showers by the atmospheric N component was studied as a function of the absorber thickness up to a total of 650-g/cm^2 Pb, or about four proton mean free paths. A difference in the cross sections would then result in the "filtering out" of the component with the shorter mean free path, and manifest itself in an attenuation curve which is the superposition of two exponentials rather than a single exponential curve. By splitting the top absorber into three sections and using three top trays instead of the usual one, with the rigid condition that only a single counter in each tray be discharged, losses due to the complete absorption of all secondaries of an interaction occurring in the top absorber were minimized and could be estimated from the results of the runs with smaller absorber thicknesses in which the lead absorber was distributed in various ways between and above the trays. Three further counter trays, placed in a lead pile, were used to select five types of showers of different multiplicity. The average energy of the primaries of these events were estimated to be about 5.3 Bev ("low-energy group"), 8.3 Bev ("medium-energy group"), and 16-20 Bev ("high-energy group"). Even after correcting for spurious events, the rates of the two latter groups—for which a substantial π-meson component can be expected—do not fit a straight line on a semilogarithmic plot, thus indicating that the mean free paths of the two components are not identical. Under the assumption of equal detection probability for the interactions of both types of primaries, the mean free path for shower production by π mesons of both energy groups is found to exceed 320 g/cm^2. It must be stressed that these results should not be interpreted as a proof for an interaction cross section smaller than the geometrical nuclear cross section, but rather as an indication that in collisions of very energetic π mesons, the number of π-meson secondaries emitted differs from that resulting from proton collisions, perhaps because of a larger probability for the production of other secondary particles. (auth)

1926

PENETRATING SHOWERS IN LIGHT AND HEAVY ELEMENTS. Joseph G. Askowith and Kurt Sitte (Syracuse Univ., N. Y.). Phys. Rev. 97, 159-65(1955) Jan. 1.

A large cloud chamber fitted with one thick "producer plate" of light materials and with eight $^1/_4$-in. lead plates was operated at Echo Lake, Colorado (altitude 3260 m) to record penetrating showers originating in three light elements (Li, C, Al) and in lead. The average primary energies, estimated with the "F-plot" method of Duller and Walker, were between 20 and 25 Bev. From a comparison

of the shower rates in the producer plates and in the top lead plate, upper and lower limits for the transparencies of the light elements are obtained, the latter if correction is made for the differences in the primary energies. More reliable values, however, are derived from a direct comparison of the rates in the three light elements. This yields a value of $\lambda = (2.55\pm0.25)\times10^{-13}$ cm for the mean free path in nuclear matter, and accordingly transparencies of (15±7) %, (12±4) %, and (6±3) %, respectively for Li, C and Al. It is shown that second-generation effects are not negligible even in light nuclei, and that they can account for the observed differences in the average multiplicities of showers initiated in the four elements studied. At a primary energy of 25 Bev, the average multiplicity of a nucleon-nucleon collision is about 3.4. The contribution of the π mesons to the intranuclear cascade is very small. This agrees well with the observed mean free path for shower production in the lead plates by secondary particles, which varies from (380±35) g/cm^2 for secondaries from light elements to (475±70) g/cm^2 for secondaries from lead. Since nuclear scattering in the lead plates was observed for secondaries from the light elements and from lead with mean free paths of (370±35) g/cm^2 and (300±36) g/cm^2 respectively, the total interaction mean free path in lead, comprising both scattering and secondary showers, is very nearly the same for secondaries emerging from light and heavy elements—about (190±25) g/cm^2—and is also close to the geometrical value. (auth)

1927

ANALYSIS OF A HIGH-ENERGY COSMIC-RAY SHOWER. I. SOFT COMPONENT AND TRIDENT PROCESS. M. Koshiba and M. F. Kaplon (Univ. of Rochester, N. Y.). Phys. Rev. 97, 193-200(1955) Jan. 1.

An analysis is presented of the soft component arising from a high-energy nuclear shower ($\sim3\times10^{13}$ ev) observed in stripped emulsion. The chief results obtained are: (1) the production ratio of neutral π mesons to charged shower particles is 0.50±0.11; (2) the lifetime of the neutral π meson is found to be $(1_{-0.5}^{+1})\times10^{-14}$ sec; (3) the mean free path for direct electron pair production by high-energy electrons is found to be 4.4 and 1.1 radiation units for electrons in the energy intervals 1 to 10 Bev and 10 to 100 Bev, respectively. (auth)

1928

DIRECT DETECTION OF SOFT RADIATION ABOVE 50 KILOMETERS IN THE AURORAL ZONE. L. H. Meredith, M. B. Gottlieb, and J. A. Van Allen (State Univ. of Iowa, Iowa City). Phys. Rev. 97, 201-5(1955) Jan. 1.

In two high-altitude rocket flights of thin-walled Geiger tubes at geomagnetic latitudes 64° and 74°N, a considerable intensity of soft radiation has been encountered above 50 km altitude. No such radiation has been found in flights of identical equipment at 88.5° and at 55.6°. The radiation is tentatively interpreted as the high-energy tail of all auroral spectrum. It may consist of electrons. (auth)

1929

COSMIC-RAY STUDIES OF PENETRATING SHOWERS AND BREMSSTRAHLUNG AT 11,200 FEET BY USING PLASTIC SCINTILLATION COUNTERS. C. N. Chou and Marcel Schein (Univ. of Chicago, Ill.). Phys. Rev. 97, 206-12(1955) Jan. 1.

An apparatus was designed to study penetrating showers produced by high-energy cosmic rays. For this purpose, four anthracene-in-polystyrene plastic scintillators of 1 and 2 cm thickness were used with lead plates of thicknesses 2.00, 2.25, and 2.25 cm, respectively, interposed between them. In addition to these scintillation counters, four trays of G-M counters and an arrangement of anticoincidence counters were used. Data on penetrating showers produced in a graphite block and a polystyrene scintillator were obtained. It was found that in the energy range from 2 to 20 Bev, the resulting integral energy spectra of the π^0 mesons can be represented by a power law with an exponent equal to -1.7 ± 0.2 in polystyrene, with no filter for the primaries. Similar results were obtained in graphite and in polystyrene with primaries filtered through 10 cm of lead. The multiplicity of the charged mesons in the penetrating showers produced in graphite can be described by a power law with an exponent -4.2 ± 0.5, in general agreement with cloud chamber results. It was found that the energy distribution of bremsstrahlung γ rays and the flux of the μ mesons producing this bremsstrahlung in a lead block of 10 cm thickness is in agreement with theory. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

1930

THE ELECTRONIC LEVELS OF ATOMS ADSORBED ON THE SURFACE OF A CRYSTAL. [PART] 1. (Elektronnye Urovni Atomov, Adsorbirovannykh Na Poverkhnosti Kristalla. 1.). F. F. Vol'kenshtein. Translated by E[sther] Rabkin from Zhur. Fiz. Khim. 21, 1317-34(1947). 42p. (TT-167; AEC-tr-367)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 1-314.

1931

X-RAY DIFFRACTION PROCEDURES FOR POLYCRYSTALLINE AND AMORPHOUS MATERIALS. Harold P. Klug and Leroy E. Alexander. New York, John Wiley and Sons, Inc., 1954. 716p.

Diffraction techniques for polycrystalline and amorphous materials, including powder, Geiger-counter spectrometric, small-angle scattering, and radial distribution methods, are brought together in this volume for ready reference. The text is prepared especially for the benefit of research workers generally unfamiliar with manipulative and interpretative details, who must acquire some skill or knowledge of the subject without benefit of outside instruction or course work. A deliberate intent of supplying too much, rather than too little detail is evident, particularly in the development of mathematical derivations. (K.S.)

1932

AN AUTOMATIC VERNEUIL FURNACE. R. K. Verm (Delhi Univ., India), G. N. Sirkar and S. Chatterjee (Institute of Nuclear Physics, Calcutta, India). J. Sci. Ind. Research (India) 13, 516-20(1954) Nov.

A Verneuil furnace is described for growing long, thin rods of inorganic crystals which crystallize at temperatures above 1000°C. Such a furnace is found suitable for growing rods of Ca and Cd tungstates for use as efficient radiation detectors. Methods of operation and control arrangements for an automatic unit are discussed. Rods of 2 to 4 mm diameter and 5 to 10 mm long can be grown, and these limits may be extended if desired. (K.S.)

1933

X-RAY-DIFFRACTION STUDY OF MONOCRYSTALLINE NaCl AND KCl PHOSPHORS ACTIVATED WITH AgCl. L. M. Shamovskii, L. M. Rodionova, G. A. Sidorenko, and

Yu. N. Zhvanko (All-Union Mineral Research Inst.). Doklady Akad. Nauk S.S.S.R. 99, 235-8(1954) Nov. 11. (In Russian)

Laue diagrams of (1) KCl crystal annealed at 750 to 760°C, (2) KCl (Ag^+, 0.64 mole %) phosphor annealed at 760°C, (3) NaCl crystal annealed at 780 to 790°C, (4) NaCl (Ag^+, 1.28 mole %) phosphor annealed at 730°C, (5) KI–KBr mixed crystal before annealing, and (6) after annealing at 640°C are illustrated and discussed. (G.Y.)

1934

ON THE ORIENTATION OF Eu^{+3} IONS IN THE CaF_2 CRYSTAL LATTICE. P. P. Feofilov. Doklady Akad. Nauk S.S.S.R. 99, 731-3(1954) Dec. 11. (In Russian)

Luminescence spectra of Eu-activated CaF_2 in normal and polarized light are shown, and the orientation of the Eu ions is discussed. (G.Y.)

ELECTRICAL DISCHARGE

1935

Westinghouse Research Labs.
FINAL REPORT [ON INVESTIGATION OF HIGH-VOLTAGE BREAKDOWN IN VACUUM, IN ORDER TO DETERMINE THE FUNDAMENTAL PROCESSES RESPONSIBLE FOR BREAKDOWN]. RESEARCH REPORT 71F159-R2. A. I. Bennett, Jr. Dec. 1, 1954. 9p. Contract AF-18(600)793. (NP-5492)

ELECTRONS

1936

ON A NON-LINEAR QUANTUM THEORY OF THE ELECTRON. D. D. Ivanenko and A. M. Brodskii. Zhur. Eksptl'. i Teoret. Fiz. 24, No. 4, 383-8(1953). (In Russian)

A nonlinearity of the type $j_\mu(x)j_\mu(x)$ is added to the Lagrangian for the electron field in interaction with radiation, given in the Heisenberg representation. A canonical transformation removes the above term and the ordinary nonlinear term $A_\mu(x)j_\mu(x)$. The transformed equations obey free-field equations. The introduction of the nonlinear term has thus simply changed the S-matrix and transitions between various free-field states are produced by it. The nonlinearity leads to a renormalization of mass, but it is not shown that a finite rest mass can be obtained. (Science Abstracts)

1937

BREMSSTRAHLUNG AND THE CREATION OF PAIRS IN THE FIELD OF THE ELECTRON. G. M. Garibyan. Zhur. Eksptl'. i Teoret. Fiz. 24, No. 6, 617-21(1953). (In Russian)

Three processes: (a) and (b) radiation accompanying electron-positron and electron-electron collisions; and (c) creation of pairs in the electron field by a γ ray are considered for the extreme cases of very small and very large energies. The formulas are taken from previous work (Izvestiya Akademii Nauk Armyanskoi S.S.R. 5, 3(1952)) where they prove to be too complex to discuss in the general case. (Science Abstracts)

1938

DOUBLE SCATTERING OF ELECTRONS WITH MAGNETIC INTERACTION. H. Mendlowitz and K. M. Case (Univ. of Michigan, Ann Arbor). Phys. Rev. 97, 33-8(1955) Jan. 1.

The Mott theory of double scattering of electrons by nuclei is extended to the case where a constant homogeneous magnetic field intervenes between the two scattering centers. The problem is treated in the Foldy-Wouthuysen representation. It is found that the presence of the magnetic field causes the asymmetry in the double-scattering cross section to be altered and that this change in the asymmetry can be utilized to determine the gyromagnetic ratio of the free electron. (auth)

1939

THE CALCULATION OF ELECTRON LENSES FROM GIVEN PARAXIAL FOCUSSING PROPERTIES. P. P. Kas'yankov. Zhur. Tekh. Fiz. 23, No. 3, 531-40(1953). (In Russian)

For an electrostatic lens, let $R = r\Phi^{1/4}$; then if R(z) is given, $\Phi = \Phi_0 \exp\left[\pm \int_{z_0}^{z} (-16R''/3R)dz\right]$, where z_0 is the axial co-ordinate of the object. What will actually be given in the magnification and the separation of object and image; the problem of choosing a suitable functional form for R is discussed in detail, special consideration being given to the choice of such functions as those of Mathieu, Bessel, and Legendre. Electrode shapes may be calculated from the axial potential by a process which is the inverse of the relaxation method. The possibility of imposing the condition that a certain primary aberration coefficient be minimized is mentioned but is not enlarged upon. (Science Abstracts)

GASES

1940

MEASUREMENT OF GAS DENSITIES WITH PARTICLE BEAM PROBES. E. Schopper and B. Schumacher. Translated from Z. Naturforsch 6A, 700-5(1951). 9p. Available from Associated Technical Services (Trans. No. 85F4G) East Orange, N. J. (AEC-tr-2067)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 6-2507.

1941

EXPERIMENTS ON THE BEHAVIOR OF AN IONIZED GAS IN A MAGNETIC FIELD. Winston H. Bostick and Morton A. Levine (Tufts Coll., Medford, Mass.). Phys. Rev. 97, 13-21(1955) Jan. 1.

Measurements with probes in a plasma of helium ions and electrons in the afterglow of an induction-excited discharge in a toroidal tube with a toroidal magnetic field reveal an oscillatory probe current which is presumably indicative of fluctuations in the ion density. The space distribution of these fluctuations and the dependency of their amplitude and frequency on the pressure and magnetic field are consistent with the assumption that plasma waves, similar to the magnetohydrodynamic type described by Alfvèn, exist in this toroid. Measurements of electron density by a microwave method in another toroidal tube, which is in the form of a microwave resonant cavity, show that in this tube the degree of diffusion control in helium at low pressures is apparently orders of magnitude less than one would calculate from the classical theory of ambipolar diffusion of ions and electrons in a magnetic field. The measurements show a marked minimum in the diffusion coefficient as a function of magnetic field at about 600 gauss. An attempt is made to explain this minimum and the lack of diffusion control in terms of plasma waves. Experimental evidence that plasma waves exist in this toroid in a magnetic field has been seen in oscillations which appear on the rf envelope of the exciting pulse from the magnetron. (auth)

INSTRUMENTS

1942

DuPont de Nemours, E. I., and Co. Explosives Dept. Atomic Energy Div.

DIFFERENTIAL ELECTROMETER. A. C. Lapsley. Dec. 1954. 12p. Contract AT(07-2)-1. (DP-95)

A differential electrometer was developed that may be used to record the amplitude of power level oscillations of a nuclear reactor by measuring the modulated output current of an ion chamber. The accuracy of the measured AC/DC ratio is ± 2% for modulation frequencies less than ¼ cps and amplitudes greater than 0.3% of the DC signal. The full-scale DC range is from 10^{-9} to 10^{-5} amp. On the lowest range a total input capacitance smaller than 20 μμf is required to prevent attenuation of a ⅛ cps modulating signal. (auth)

1943

Los Alamos Scientific Lab.

A NEW MULTI-CHANNEL RECORDING TIME-DELAY ANALYZER. C. W. Johnstone, G[eorge] R[obert] Keepin, Jr., P. G. Koontz, and J[ames] D. Gallagher. Oct. 1954. 34p. Contract W-7405-eng-36. (LA-1856)

A new time-delay analyzer encompassing a flexible time base is described. Time channels of 0.001, 0.01, 0.1, 1, and 10 sec width are provided. These may be combined in progressive sequence or used individually for essentially an infinite number of channels. Provision is made for either photographic or electric recording. Data obtained with the new analyzer agree with a conventional ten-channel time-delay analyzer over the limited range of the latter. A simple procedure is given for checking correct operation of the system. (auth)

1944

Department of Mines and Technical Surveys. Mines Branch (Canada)

A TRANSISTOR HIGH VOLTAGE POWER SUPPLY FOR PORTABLE GEIGER COUNTERS. G. E. Alexander. Nov. 30, 1954. 10p. (NP-5475; TR-125/54)

The high-voltage supply described is the result of work carried out in an effort to construct a compact source of high voltage for use in portable Geiger equipment. This unit consists of an ultrasonic transistor oscillator, which produces the alternating current in the primary of a step-up transformer, and a voltage quadrupler rectifier circuit. Using a 15-v hearing-aid battery as a source of energy, potentials of 1200 v with a load current of 50 μa have been obtained from the circuit. (auth)

1945

Naval Research Lab.

COMPARISON OF GEIGER-COUNTER AND PHOTOGRAPHIC TECHNIQUES FOR SINGLE-CRYSTAL X-RAY STUDIES. A. B. Wing and L[aVerne] S. Birks. Sept. 30, 1954. 34p. (NRL-4402)

Single-crystal, x-ray intensity data were obtained on ammonium dihydrogen phosphate (ADP) by standard photographic techniques and also with the two-circle, Geiger-counter spectrometer designed at NRL. Statistical treatment of the intensity data indicated that the standard deviations of Geiger-counter data averaged about 10% as compared with 17% for photographic data. The Geiger-counter method required about twice as much time as the photographic method for the same amount of data. Similar corrections of the intensity data to obtain F^2 values were required in both methods. Complete three-dimensional F^2 data are tabulated for use in determining the atomic coordinates in ADP. (auth)

1946

Rochester Univ.

A MERCURY RELAY PULSE GENERATOR. D. A. Bromley, A. Hamann, and N. S. Wall. Dec. 13, 1954. 5p. Contract AT(30-1)-875. (NYO-6543)

A circuit was designed for generating fast and clean rising pulses for the testing and calibration of nuclear instrumentation used with scintillation and ionization chamber detectors. Two Western Electric type 276-G polarized Hg relays are used in such a way that the relative phase of the 60-cycle driving voltage causes the second relay to short the output of the first relay just before the second (relay opening) unwanted pulse occurs. Rise time of 0.15 to 6μsec, and decay times of 20 to 2000 μsec are provided. (K.S.)

1947

THICKNESS GAGES PARTICULARLY FOR MEASURING BAND THICKNESSES IN ROLLING. I. INDUCTION AND X-RAY TYPES. N. deBall. Translated from Arch. Tech. Messen, Lf. 213, 219-22(1953). 9p. (AEC-tr-2064)

1948

INEXPENSIVE METHOD OF MEASURING SURFACE FINISH. M. Matsunaga (Univ. of Tokyo, Chiba, Japan). Rev. Sci. Instr. 25, 1221-2(1954) Dec.

A simple apparatus was designed to determine the quality of a surface finish by measuring the electrical contact resistance. Application of the device to corrosion testing is indicated. (K.S.)

1949

DIRECT VOLTAGE STABILIZERS IN THE RANGE 10-100 KV WITH PARTICULAR REFERENCE TO DEGENERATIVE SYSTEMS. M. W. Jervis (Associated Electrical Industries Ltd., Aldermaston, Berks, England). J. Brit. Inst. Radio Engrs. 14, 629-36(1954) Dec.

Methods of stablizing high direct voltages are described, and it is concluded that the degenerative arrangement gives the best stability. The residual fluctuations then depend on the loop gain and the stability of the reference elements. The maximum loop gain which can be applied depends on the frequency response on the system. In practice, loop gains of the order of 1,000 are possible, so reducing the effect of line voltage and load current fluctuations by this factor. Reference elements are reviewed, and it is concluded that wirewound resistance potential dividers or energy-analysers are the most stable, stabilities of the order of 1 in 10^5 being obtained. (auth)

1950

PARTICLE MICROSCOPY USING LITHIUM IONS. Maurice Gauzit. Ann. phys. 9, 683-730(1954) Nov.-Dec. (In French)

The advantages of using Li ion beams rather than electrons in a particle microscope are discussed. Instrument design factors are considered for a relatively standard electron microscope configuration using a Li ion source. Large increases in resolving power over the electron microscope are reported. (K.S.)

1951

SMALL-CURRENT D-C AMPLIFIER. G. F. Zindler and Newton Underwood (Univ. of North Carolina, Raleigh). Nucleonics 13, No. 1, 62-3(1955) Jan.

A two-stage d-c amplifier has been developed that can provide a full-scale sensitivity of 10^{-13} amp. Good stability has been achieved by using 100% negative feedback. The amplifier is used to measure small d-c currents from high-impedance sources such as photocells and ion chambers. The output stage is capable of driving a 0 to 1 ma recorder. (M.P.G.)

ISOTOPES

1952

THE O^{18}-ABUNDANCE IN FRESH WATER. Willi Dansgaard (Universitetets biofysiske laboratorium, København, Denmark). Geochim. et Cosmochim. Acta 6, 241-60(1954) Dec.

Fresh water of various origins as distinct from ocean water shows great variations in O^{18} abundance. Proceeding from the temperate towards the colder climates a considerable decrease is noticeable. It is demonstrated that the O^{18} abundance in atmospheric water vapor is dependent on (a) the precipitation temperature, (b) the origin of the vapor, and (c) the average cooling of the vapor during the circulation of the water in nature, whereas the O^{18} abundance in a certain precipitation depends on (d) the condensation temperature, (e) the cooling since the beginning of the condensation of the vapor in question, and (f) the evaporation during the fall of the precipitation from cloud to ground. Furthermore, the O^{18} abundance in ground water from a certain locality depends on (g) the evaporation from the precipitation since its reaching the ground and (h) the possible exchange of O^{18} between the water and oxygenic substances in the ground. Computations on this basis and on measurements of the O^{18} abundance of ocean water are in agreement with measurements of fresh water of various origins. (auth)

1953

PRODUCING RADIOISOTOPES IN VERY LOW POWER REACTORS. A. A. Jarrett and S. Berger (North American Aviation, Inc., Downey, Calif.). NAA-AER-1018 (Condensed in Nucleonics 13, No. 1, 64(1955) Jan.)

The production of short-lived isotopes in a local, low-power reactor is discussed. Isotopes are listed which are producible in a 1 hr irradiation by a 1 w nuclear reactor in sufficient specific activity for use in tracer experiments. A reactor similar to North American Aviation's Water Boiler Neutron Source could be used. (M.P.G.)

1954

ISOTOPIC MIGRATION AND SELFMIGRATION IN METALS. Alfred Klemm (Max-Planck-Institut fur Chemie, Mainz, Germany). Z. Naturforsch. 9a, 1031-5(1954) Dec. (In German)

The electromigration of light isotopes to the anode in fused Hg and Ga is explained as follows: there are in the metal movable and relatively immovable ions. The movable ions remain by the fused Hg and Ga in an especially powerful reciprocal action with electrons and therefore are transferred to the anode like the heavy isotopes, since their mobility relative to the immovable ions is greater than the heavy isotopes. (tr-auth)

ISOTOPE SEPARATION

1955

Oak Ridge National Lab., Y-12 Area
THE ELECTROMAGNETIC CONCENTRATION OF BERYLLIUM-10. W. A. Bell and L. O. Love. Mar. 22, 1950. Decl. Oct. 5, 1954. 32p. Contract W-7405-eng-26. (Y-577)

This report covers the exploratory and production operations involved in electromagnetically separating 10 micrograms of Be^{10}. Information on safety procedures, ion source and receiver units, and product purity has been included. The feasibility of concentrating microgram quantities of an isotope is shown. (auth)

1956

Oak Ridge National Lab., Y-12 Area
THE ELECTROMAGNETIC CONCENTRATION OF POTASSIUM-40. L. O. Love and W. A. Bell. June 27, 1950. Decl. Oct. 5, 1954. 27p. Contract W-7405-eng-26. (Y-623)

Interest in K^{40} at other laboratories led to requests for relatively high isotopic purity samples. This report describes the calutron equipment and operating procedures used in collecting 30 mg K^{40} enriched to an abundance of 7.13 per cent—an approximate 700-fold enhancement. Complete potassium isotope distribution is shown to indicate the range of interest. (auth)

1957

Oak Ridge National Lab., Y-12 Area
THE ELECTROMAGNETIC CONCENTRATION OF BROMINE. H. J. Buttram, L. O. Love, and W. A. Bell. Oct. 12, 1950. Decl. Oct. 5, 1954. 15p. Contract W-7405-eng-26. (Y-671)

Bromine was processed in the calutron to produce enrichment of both of its stable isotopes (Br^{79} and Br^{81}). (L.T.W.)

1958

ENRICHMENT OF RADIOACTIVE ELEMENTS BY THE METHOD OF RECOIL NUCLEI. A. N. Murin and V. D. Nefedov. Translated by V. Beak from Uspekhi Khim. 21, 536-65(1952). 35p. (AERE-Lib/Trans-464)

Radioactive isotopes obtained by (n,γ) reactions can be separated by making use of radioactive recoil. In some chemical compounds, capture of a neutron by a nucleus may provide the atom with enough recoil energy from γ emission to sever the chemical bonds, making chemical separation of the atom from the compound possible. The basic problems of the method are reviewed. General techniques for separating the isotopes are discussed, and specific separation cases are described. (M.P.G.)

1959

ON THE ISOLATION OF THE RADIO-ISOTOPES OF ZINC, GALLIUM, INDIUM, VANADIUM, MOLYBDENUM, PALLADIUM, OSMIUM, IRIDIUM, AND PLATINUM IN A PRACTICALLY CARRIER-FREE STATE BY THE (n,γ) RECOIL PROCESS FROM METALLIC COMPLEXES OF PHTHALOCYANINE. Wilfrid Herr. Translated by F. Hudswell from Z. Naturforsch. 7b, 201-7(1953). 10p. (AERE-Lib/Trans-498)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 6-4017.

1960

THE CHEMICAL SEPARATION OF ISOTOPES AS A PROBLEM OF RECTIFICATION. Cesare Marchetti (Laboratori CISE, Milan, Italy). Z. Naturforsch. 9a, 1012-16(1954) Dec. (In English)

The best operation of a column for separating isotopes by chemical exchange reactions and the best cascading of a

plant are discussed. The results are presented in a form directly utilizable by the plant designer. (auth)

MASS SPECTROGRAPHY

1961

Carbide and Carbon Chemicals Co. (Y-12)
THE MASS SPECTROMETER; A LITERATURE SEARCH. (1953 SUPPLEMENT). John W. Wachter and Frances L. Sachs. Oct. 20, 1954. 96p. Contract W-7405-Eng-26. (Y-958(1953 Suppl.))

An annual supplement to Y-958, consisting of a collection of 211 abstracts of articles dealing with the design and construction of mass spectrometers and related topics, is presented. Subject, author, and patent indexes are included. (J.E.D.)

MEASURING INSTRUMENTS AND TECHNIQUES

1962

Brookhaven National Lab.
CALCULATIONS ON THE LEAD GLASS PLATE SPECTROSCOPE. R. Sternheimer. Oct. 14, 1952. 6p. (AECU-2983)

The efficiency of a lead-glass plate γ-ray spectroscope used with a scintillating liquid has been calculated. The fraction of energy deposited inside a cylindrical volume of length 7.5 in. and radius 2 in. when a 2000-Mev electron impinges on the crystal within the cylinder was found to be 0.795. Taking into consideration the fluctuation in energy due to the escape of low energy electrons and soft γ rays, the energy deposited was estimated to lie between the limits 1618 ± 94 Mev for a shower initiated by a 2000-Mev γ ray. When the effect of the layers of scintillating liquid was considered, the value for the energy deposited was reduced to 1500 Mev. The possibility of using the lead-glass plates as producers of Cherenkov radiation was discussed. It was estimated that the energy of the pulse due to Cherenkov radiation was 210 ± 12 kev. (M.P.G.)

1963

Brookhaven National Lab.
CALCULATIONS ON THE LEAD GLASS SPECTROSCOPE. [ADDITIONAL RESULTS]. R. Sternheimer. Nov. 10, 1952. 5p. (AECU-2984)

The fluctuations in the number of electrons traversing each layer of a lead-glass-plate spectroscope have been investigated. The average number of electrons at the n^{th} layer for various energies E_0 of the incident γ ray was calculated and plotted as a function of n. The sampling uncertainty $|k|$ was estimated as a function of E_0. The energy of the pulse for an incident photon was determined to lie between the limits $0.075\ E_0\ (1 \pm |k|)$, where 0.075 is the average fraction deposited in the layers. It was found that the effects of pair production and straggling could be neglected. The average ratio of the scintillation pulse to the Cherenkov pulse was found to be 370. (M.P.G.)

1964

Wisconsin Univ.
THE THERMOLUMINESCENCE DOSIMETER. FINAL REPORT. Farrington Daniels and William P. Rieman. Feb. 16, 1954. 20p. Contract DA18-108-CML-3069, [Report] No. 7. (NP-5499; ETF-760-274/Final)

A thermoluminescent γ radiation dosimeter is described which consists of a silver button containing a sapphire powder mesh cemented together with 25% of its weight of silver chloride. These dosimeter buttons are easy to make, insoluble, stable under rough conditions, and should cost less than 10 cents each. An improved reader is under construction. No thermoluminescence was observed below 170°C, and it is expected that the reading of the dosimeter reader will continue to be independent of the time following exposure to radiation. It was found that radioactive patients could swallow the dosimeter pellets for measurement of internal exposure. (C.H.)

1965

Polaroid Corp.
RADIAC DETECTING ELEMENTS DT64()/PD and DT65()/PD. FINAL REPORT. Oct. 1, 1954. 109p. Contract DA-36-039-SC-15548. (NP-5500)

Photographic film badges are described which permit the wearers to know their γ dose within minutes after exposure. A record of the dose is accumulated on a negative photographic film. To read the dose, the wearer pulls a tab which causes the exposure on the negative to be transferred to a positive within the film holder. The dose received is measured by matching the gray of the positive to an adjacent calibrated gray scale. Satisfactory negatives have been produced for recording in 5 steps dosages from 50 to 500 r and from 1 to 10 r. It was found to be most practical to measure dosage in a maximum of 5 steps, and a factor of 10 from lowest to highest dose appeared to be best. Accuracy of the dosage indication immediately after time of manufacture can be within ± 25% of the calibration. Investigations to determine accuracy, shelf life, optimium calibration techniques, and mass production techniques are described in detail. (M.P.G.)

1966

Atomic Energy Project, Univ. of Calif., Los Angeles
A MULTICHANNEL TELEMETERING SYSTEM FOR THE DETECTION AND RECORDING OF ATMOSPHERIC RADIATION. William R. Kennedy and Frank C. Strebe. Sept. 15, 1954. 23p. Contract AT-04-1-GEN-12. (UCLA-305)

The use of multichannel telemetering systems for atmospheric radiation monitoring is discussed. Brief comparisons are made between different possible systems which could be used for this purpose. A two-channel system which was designed and constructed is described. Block diagrams and schematic drawings are included for this unit. (auth)

1967

CALCULATION OF THE ACTUAL DEPTH OF EMULSIONS IN INVESTIGATIONS OF NUCLEAR PROCESSES BY THE PHOTOGRAPHIC METHOD. A. A. Bene and M. M. Agrest. Zhur. Eksptl'. i Teoret. Fiz. 27, 557-62(1954) Nov. (In Russian)

The correction to apply to the emulsion thickness to determine the actual number of nuclear particle tracks within a given solid angle is calculated and, as an example, is applied to data on the $Li^6(n, \alpha)T$ reaction. (G.Y.)

1968

FUNDAMENTAL CHARACTERISTICS OF IONIZATION CHAMBERS. N. I. Shteinbok. Zhur. Eksptl'. i Teoret. Fiz. 27, 615-24(1954) Nov. (In Russian)

The behavior of a flat-plate ionization chamber under continuous Ra α irradiation and in the absence of ion diffusion and space charge has been investigated in detail. (G.Y.)

1969

HIGH-LUMINOSITY SECTOR-TYPE SPECTROMETER WITH IMPROVED FOCUSING. E. E. Berlovich. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 589–98(1954) Sept.-Oct. (In Russian)

The principles involved in construction of this $\beta-\gamma$ spectrometer are described. (G.Y.)

1970

THE RITRON, A GAMMA SPECTROMETER UTILIZING ELECTRON EMISSION. B. S. Dzhelepov, N. N. Zhukovskii, and Yu. V. Khol'nov. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 599–624(1954) Sept.-Oct. (In Russian)

The apparatus designed for investigating γ spectra in the energy range 300 to 4000 kev is described, and representative spectra obtained with it are shown. (G.Y.)

1971

FAST DETECTOR FOR FISSION COUNTING. Grenfell P. Boicourt and John E. Brolley, Jr. (Los Alamos Scientific Lab., New Mexico). Rev. Sci. Instr. 25, 1218–19(1954) Dec.

A fission counting device is described which converts the UV scintillations in a noble gas, induced by fission fragments or α particles, into visible light by means of a polystyrene film containing 5% tetraphenyl–butadiene. The film is mounted directly on a photomultiplier tube. A 20% resolution on the U^{234} α peak was obtained with krypton. (K.S.)

1972

CALORIMETRIC MEASUREMENT OF ACTIVITY AND NUMBER OF γ QUANTA DURING THE ACT OF DECAY. K. K. Aglintsev and E. A. Khol'nova (Mendeleev All-Union Research Institute of Metrology). Doklady Akad. Nauk S.S.S.R. 98, 357–60(1954) Sept. 21. (In Russian)

Separate γ and β calorimeters are illustrated by which the absolute number of γ quanta emitted during β decay can be determined. The following data are given for Sb^{124}, the first figure being the literature value of the γ energy in kev, that in parentheses the absolute number of γ quanta per β emission: 597 (0.88); 650 (0.074); 711 (0.118); 958 (0.041); 1052 (0.027); 1347 (0.105); 1691 (0.62); and 2070 (0.062). (G.Y.)

1973

EFFECT OF THE LIMITED PROPORTIONALITY REGION ON THE THRESHOLD VALUE OF CYLINDRICAL GLASS GEIGER COUNTERS WITH EXTERNAL ELECTRODES. Daniel Blanc. Compt. rend. 239, 1621–2(1954) Dec. 8. (In French)

The semi-proportional pulses in a Geiger counter charge the internal volume of the tube and thus increase the threshold. For monoenergetic γ radiation, this increase is proportional to the counting rate as long as the interval separating two successive pulses is larger or equal to the restitution time. Under harder irradiation, the threshold tends to a limiting value. (tr-auth)

1974

ELECTROLUMINESCENCE OF CARBAZOLE BY ALTERNATING ELECTRIC FIELDS; THE NATURE OF ORGANIC ELECTROPHOTOLUMINESCENCE. Andre Bernanose and Gerard Marquet. J. chim. phys. 51, 255–9(1954) May. (In French)

It has been previously shown that it is possible to excite luminescence in phosphorescent organic films by the sole influence of alternating electric fields. For the case of carbazole, the additional phenomenon of electrophotoluminescence has been observed. Total luminescence of the irradiated material is therefore due to two effects: electrophotoluminescence decreasing exponentially with time, and natural electroluminescence constant in time. (tr-auth)

1975

SIMPLIFIED APPARATUS FOR BRAIN TUMOR SURVEYS. Herbert C. Allen, Jr. (V. A. Hospital, Houston, Texas) and J. R. Risser (Rice Inst., Houston, Texas). Nucleonics 13, No. 1, 28–31(1955) Jan.

A single scintillation detector for detecting weak tumor response in the presence of surrounding masses of active tissues and blood reservoirs is described. The detector, a NaI crystal mounted on a photomultiplier tube, is located as far as possible from the surface of the head to minimize the effect of the inverse-square law in discriminating against a deep tumor in favor of a tumor near the surface. A single-channel differential-pulse-height analyzer counts only the 364-kev γ rays from I^{131}. This lowers the background by a factor of 10 while decreasing the sample counting rate by only 2. The detector has been successful in a number of cases confirmed by surgery or necropsy. (M.P.G.)

1976

IMPORTANCE OF SOLVENT IN LIQUID SCINTILLATORS. F. N. Hayes, Betty S. Rogers, and Phyllis C. Sanders (Los Alamos Scientific Lab., New Mex.). Nucleonics 13, No. 1, 46–8(1955) Jan.

Liquid scintillator solvents have been studied to assist in the choice of solvents for special applications. The optical densities of 44 solvents were measured. The wavelengths in which the photon mean free path is 0.5, 1.0, and 2.0 meters are tabulated. Relative pulse-height measurements were made on 49 solvents with an emitting solute of 2,5-diphenyloxazole. The solvent p-xylene was found to allow the greatest pulse height. Relative pulse height as a function of solvent concentration in toluene was plotted for 35 solvents. (M.P.G.)

1977

MONITOR MEASURES AIR AND SURFACE CONTAMINATION. H. V. Watts, A. R. Brauner, G. M. Burgwald, and L. Reiffel (Armour Research Foundation, Chicago, Ill.). Nucleonics 13, No. 1, 51–2(1955) Jan.

A compact unit has been constructed capable of providing complete monitoring facilities for a radioisotopes laboratory of moderate size. Air samples are collected on a continuously moving filter tape. Four detectors measure the α and $\beta-\gamma$ components of the air samples at collection time and after a preselected 7 to 12 hr delay. The detectors operate simultaneously, each with its own calibrated meter. Data can be recorded by means of a strip-chart milliameter. Two surface survey probes are provided which can be switched into the circuitry of the delayed detectors. Abnormally high radiation intensity measured by the prompt detectors will sound an alarm. (M.P.G.)

1978

ABSOLUTE DOSE MEASUREMENT OF COBALT-60 RADIATION. H. E. Johns, D. V. Cormack, G. F. Whitmore, and C. Garrett (Univ. of Saskatchewan and Saskatchewan Cancer Commision, Canada). Radiology 64, 113–14(1955) Jan.

Measurements of Co^{60} γ radiation made with Victoreen chambers are compared with measurements made with carbon chambers of known volume placed 80 cm from the source. Correction factors for use with Victoreen chambers are discussed. (C.H.)

1979

INTEGRAL DOSE MEASUREMENTS. PRELIMINARY RE-

PORT ON A Co^{60} TELETHERAPY BEAM. L. D. MacDonald, R. L. Hayes, and M. Brucer (Oak Ridge Inst. of Nuclear Studies, Tenn.). Radiology 64, 115–16(1955) Jan.

Results are presented from a study of the integral dose relationship involved in Co^{60} teletherapy. Phantom techniques and aqueous chemical dosimetry were adapted to the dosage determinations. (C.H.)

1980

MEASUREMENT IN VIVO OF RADIUM GAMMA-RAY ACTIVITIES LOWER THAN K^{40} LEVELS EXISTING IN THE HUMAN BODY. L. D. Marinelli, C. E. Miller, R.E. Rowland, and J. E. Rose (Argonne National Lab., Lemont, Ill.). Radiology 64, 116(1955) Jan.

Large crystals of NaI and CsI and a large plastic scintillator housed in a room shielded by 8 in. Fe were used in the measurement of γ radiation emitted by small amounts of Ra in the skeleton of persons with positive and negative radium exposure history. A two-hour reading of pulses generated in the plastic and large NaI scintillators provided a reading having a standard deviation of $\pm 3.4 \times 10^{-4}$ μc in the measurement of Ra and 4.8 gm in the measurement of K. (C.H.)

1981

ASSAY OF P^{32} BY BREMSSTRAHLUNG COUNTING WITH A WELL-TYPE SCINTILLATION CRYSTAL. Robert Loevinger and Sergei Feitelberg (Mount Sinai Hospital, New York). Radiology 64, 116–17(1955) Jan.

A method is described for the assay of P^{32} in liquid samples which utilizes bremsstrahlung counting with a well-type scintillation crystal. (C.H.)

1982

CONDITIONS FOR DISCRIMINATING BETWEEN BACKGROUND AND TRACKS IN NUCLEAR EMULSIONS. T. A. Brody. Rev. mex. fis. 3, 217–28(1954) Oct. (In Spanish)

The apparent length of tracks in nuclear emulsions vary as a function of the grain density in the tracks and of clouding by the background. For determining the necessary correction, "artificial emulsions" were prepared with randomly distributed points in two dimensions for the background and one dimension for the tracks. The microscopic appearance of the emulsions is simulated by a background on transparent material photographed in a manner giving an indistinct image superposed on that of the tracks. A statistical analysis of the lengths, made by a number of observers, gives a correction formula for the length: $\Delta L = 19.54 + 6.02d - 0.283 D - 0.087 dD$, where ΔL is in μ, d is the density of the background in grains / $100\mu^2$, and D is the density of the track grains in grains /100 μ. (tr-auth)

1983

AN X-RAY THICKNESS GAUGE FOR THE MEASUREMENT OF HOT-ROLLED STRIP STEEL. F. H. Gottfeld and D. Tidbury (Solus-Schall Ltd., London, England). J. Brit. Inst. Radio Engrs. 14, 622–6(1954) Dec.

The increased demand for close control of rolling tolerances in hot or cold strip and sheet mills has led to the development of special x-ray thickness measuring equipment. It functions by measuring the absorption of x rays in the material, and, from the results thus obtained, highly accurate deductions can be made regarding the thickness of the strip. A description of the radiation source, differential detection equipment, and reference wedges is given. (auth)

MESONS

1984

PHOTOPRODUCTION OF MESONS IN THE THEORY OF RADIATION DAMPING. V. Mikhailov and A. Baldin. Zhur. Ekspti'. i Teoret. Fiz. 24, No. 5, 613–15(1953). (In Russian)

The usual perturbation theory predicts an approximately isotropic distribution of π^0 mesons, in contradiction with experiment. Calculations are carried through here with a symmetrical pseudoscalar coupling ($g^2/\hbar c \sim 1$) and yield results which are qualitatively in agreement with the experimental distribution, without destroying the previous agreement for the production of π^+ mesons. (Science Abstracts)

1985

THE MASS OF A π^-–MESON DETERMINED FROM A δ–STAR. W. F. Fry and J. Schneps (Univ. of Wisconsin, Madison). Nuovo cimento (10) 1, 272–3(1955) Jan. (In English)

A nuclear emulsion was found which contained a cosmic-ray event representing a π^- absorption where all of the rest energy of the meson was converted into the kinetic energy of charged particles. A measurement of the secondary particles yields a rest-mass value of $283 \pm 16 m_e$ for the π^- meson. (K.S.)

1986

Λ^0 PRODUCTION IN NUCLEI. Robert Jastrow (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 97, 181–3(1955) Jan. 1.

Nuclear cross sections for Λ^0 production are interpreted in terms of production by pion–nucleon and nucleon–nucleon interactions. (auth)

1987

PHOTOPRODUCTION OF π^0 MESONS FROM PROTONS. Y. Goldschmidt-Clermont, L. S. Osborne, and M. Scott (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 97, 188–93(1955) Jan. 1.

The yield of π^0 mesons from gamma rays on protons has been measured as a function of center-of-mass angle for gamma-ray energies from 170 Mev to 340 Mev. The results are shown to be consistent with a model of production predominantly through a $J = {}^3/_2$, isotopic spin ${}^3/_2$ state, which is resonant at about 300 Mev gamma-ray energy. There is evidence for S-state production and possibly electric quadrupole, P-wave production through the resonant state. (auth)

1988

ANGULAR CORRELATION EFFECTS IN UNSTABLE PARTICLE DECAY. S. B. Treiman, Geo. T. Reynolds, and A. L. Hodson (Palmer Physical Lab., Princeton, N. J.). Phys. Rev. 97, 244–5(1955) Jan. 1.

An experimental method is described which can provide an estimate of the lower limit of the spins of unstable particles which undergo two-body decay. (L.T.W.)

1989

ORIENTATION OF PLANES IN DOUBLE V^0 DECAY EVENTS. J. Ballam, A. L. Hodson, W. Martin, R. Ronald Rau, Geo. T. Reynolds, and S. B. Treiman (Palmer Physical Lab., Princeton, N. J.). Phys. Rev. 97, 245–6(1955) Jan. 1.

In a set of 30,000 photographs taken of a Wilson cloud chamber operated in a magnetic field, seven events were found in which a pair of V^0 particles appear to come from a common origin. These have been analyzed for possible angular correlations between the decay planes, as discussed in the preceding paper (see immediately preceding abstract). (L.T.W.)

METEOROLOGY

1990

EFFECTS OF ATOMIC EXPLOSIONS ON WEATHER. L.

Machta and D. L. Harris (U. S. Weather Bureau, Washington, D. C.). Science 121, 75-81(1955) Jan. 21.

A careful examination of recent climatic data leads to the conclusion that atomic explosions have not changed the weather. (C.H.)

NEUTRONS

1991

Naval Radiological Defense Lab.

THE PRODUCTION OF NEUTRONS WITH A 2 MEV ELECTROSTATIC ACCELERATOR. Steven W. Ross. Aug. 20, 1954. 60p. (USNRDL-TR-15)

The report gives a survey of the production of neutrons by means of accelerated charged particles. An introductory discussion of nuclear physics is given with emphasis on neutron production, detection, and shielding. Neutron producing reactions using charged particles are listed along with a detailed discussion of each neutron reaction. Angular distribution of neutrons and methods of measuring the neutron flux are described. Gamma ray contamination for some of the neutron sources is discussed. (auth)

1992

MACROSCOPIC ASPECTS OF NEUTRON INTERACTION IN MAGNETICS. Louis Gold (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 97, 79-80(1955) Jan. 1.

The interaction of neutrons with magnetic materials, as described by the Halpern-Holstein relations that properly include the role of the domain structure, is characterized macroscopically. Certain interesting properties of these relations are delineated, such as the inequality $K^2 + Kp - w^2 \geq 0$ which restricts the physically meaningful combinations of the absorption coefficient K and the polarization and depolarization parameters w and p, respectively. This particular finding establishes a criterion for the validity of theoretically evaluated constants derived from microscopic treatment of neutron scattering and depolarization phenomena. (auth)

1993

CROSS SECTIONS FOR PRODUCING HIGH-ENERGY NEUTRONS FROM CARBON TARGETS BOMBARDED BY PROTONS, DEUTERONS, AND He^3 PARTICLES. Larry Schecter, Walter E. Crandall, George P. Millburn, and John Ise, Jr. (Univ. of California, Berkeley). Phys. Rev. 97, 184-7(1955) Jan. 1.

The differential cross sections $d\sigma/d\Omega$, for producing neutrons with energy in excess of 20 Mev from carbon targets bombarded by 340-Mev protons, 190-Mev deuterons, and 490-Mev He^3 particles were measured. The absolute cross sections were determined by counting identical carbon targets and neutron detector foils in equivalent geometry and utilizing the known ratios of excitation functions for the neutron and bombarding particles. (auth)

NUCLEAR PHYSICS

1994

Ames Lab.

QUARTERLY SUMMARY RESEARCH REPORT IN PHYSICS FOR JULY, AUGUST, AND SEPTEMBER 1954. Dec. 21, 1954. 14p. Contract W-7405-eng-82. (ISC-533)

The β spectrum of C^{14} was investigated with an intermediate-image spectrometer. The Kurie plot was linear above 7 kev, and the maximum energy was 158.5 ± 0.5 Mev. Similar studies are reported on the β spectra of P^{32}, K^{42}, As^{76}. L subshell conversion ratios were determined for the 112-kev transition in Lu^{177}, and the 85.1-kev transition in Tb^{160}. It is concluded from the data obtained that both transitions are E2. The ratio of ionizations from α particles of U^{234} and the $B^{10}(n,\alpha)Li^7$ were compared in A, A + CO_2, and A + N_2. Cloud chamber studies were continued on the photoproduction of protons and deuterons from S. The ratio of deuterons to protons from a thin S target irradiated with 67-Mev bremsstrahlung is 0.15 ± 0.04. The decay scheme of Te^{129} is reported. Other data are reported on the thermal conductivity of U, the resistivity of Cu_2Se as a function of temperature, and the heat of sublimination of Dy. (For preceding report in series see ISC-508.) (K.S.)

1995

INDEPENDENT-PARTICLE MODEL AND THE NUCLEAR PHOTOEFFECT. II. J. S. Levinger (Louisiana State Univ., Baton Rouge). Phys. Rev. 97, 122-30(1955) Jan. 1. (cf. NSA 8-5341)

A simple harmonic oscillator independent-particle model is used for sum-rule calculation of electric dipole transitions in the nuclear photoeffect. First the level spacing $\hbar\omega = 42A^{-1/3}$ Mev for nuclear radius parameter $r_0 = 1.2$ is found. Combining this result with the integrated cross section, a value for the bremsstrahlung-weighted cross section $\sigma_b = \int (\sigma/W)\, dW = 0.36A^{4/3}$ millibarns is found. The calculated σ_b is not inconsistent with a preliminary analysis of experimental measurements for He, Be, C, Al, Cu, Mo, Ag, Ta, Pb, and U. The simple harmonic oscillator independent-particle model is also used to calculate the increase in the integrated cross section due to neutron-proton exchange forces. The relative increase is not far from the Levinger-Bethe value of 0.8x (where x is the fraction of exchange force) for the closed-shell nuclei He^4, O^{16}, and Ca^{40}, for both Gaussian and Yukawa neutron-proton potentials, and for two values of the radius parameter r_0: 1.2 or 1.5. (auth)

1996

COLLISION MATRICES FOR THE COMPOUND NUCLEUS. R. G. Thomas (Los Alamos Scientific Lab., New Mexico). Phys. Rev. 97, 224-37(1955) Jan. 1.

The collision matrix found by Newton to satisfy at all excitation energies the requirement that it describe an excited nucleus whose decay is independent of the mode of formation is shown to imply the vanishing of the absorption cross sections at high energies where the levels overlap and therefore does not describe a compound nucleus in the usual sense. The essential characteristic of this matrix is the high degree of the correlations of the signs of the square roots $\gamma\lambda_c$ of the reduced level widths for the various levels λ and channels c. On the other hand, a collision matrix, which is similar to one first considered by Bethe and involves $\gamma\lambda_c$ whose signs are uncorrelated, implies energy average decays that are independent of the formation mode and absorption cross sections that are of the order of magnitude of the nuclear area at high energies. These matrices are derived and discussed by using the R-matrix theory of Wigner, Eisenbud, and Teichmann. It is shown that the Bethe form of the collision matrix, which is valid only if all of the partial level widths are much less than the spacings, may be modified by means of the Teichmann-Wigner channel elimination procedure so that it is also valid in situations where some of the partial widths exceed the spacings. The form of the compound-nucleus collision matrix thus obtained is similar to one deduced by Weisskopf by considerations involving the

compound-nucleus hypothesis and the reciprocity theorem. The pole strength functions s_c, which are the averages of the ratios of reduced widths $\gamma\lambda_c^2$ to level spacings and their Stieltjes energy transforms are decisive in the determination of the behavior of these collision matrices and their associated cross sections. The s functions and their transforms are presented and discussed in the cases of the strong-coupling and complex square well potential representations of the particle-nuclei interactions. The latter representation with an additional surface absorption is also considered. The present theory indicates that the imaginary part of the complex square well potential should increase with the absorption width, and it suggests a "giant resonance" interpretation of the average cross-section behaviors. The effect of the compound nucleus on non-compound-nucleus processes such as stripping and pickup is also mentioned. (auth)

1997

DEUTERON STRIPPING AND THE PROBLEM OF NUCLEAR RADII. L. N. Cooper and W. Tobocman (Institute for Advanced Study, Princeton, N. J.). Phys. Rev. 97, 243-4 (1955) Jan. 1.

It is pointed out in this note that the measurement of cross sections for deuteron stripping (or pick-up) reactions can provide a direct experimental measurement of the difference in the probability of finding a proton or a neutron at the surface of a nucleus. (L.T.W.)

1998

ISOBARIC SPINS AND CONGRUENT STATES OF ATOMIC NUCLEI. B. S. Dzhelepov. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 523-61(1954) Sept.-Oct. (In Russian)

A lengthy discussion and literature review with compilation of data are presented. 100 references. (G.Y.)

1999

ALPHA DECAY AND THE SHELL MODEL. L. A. Sliv and L. K. Peker (Leningrad Physico-Technical Inst.). Doklady Akad. Nauk S.S.S.R. 99, 727-30(1954) Dec. 11. (In Russian)

A close connection between the probability of α decay and the filling in of nuclear shells is shown for the isotopes of Bi, Po, At, and Rn. (G.Y.)

2000

TOWARD A STATISTICAL THEORY OF THE ATOMIC NUCLEUS. II. A. A. Sokolov and B. K. Kerimov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 26, 430-8(1954) Apr. (In Russian)

2001

ON THE DIRECT INTERACTION IN NUCLEAR REACTIONS. Satio Hayakawa and Tatuya Sasakawa (Kyoto Univ., Japan). Progr. Theoret. Phys. (Japan) 12, 401-2(1954) Sept.

2002

AN EMPIRICAL "CHARGE DEPENDENCE" RELATION TO THE REST-MASSES OF ELEMENTARY PARTICLES. Sadae Yoshikawa and Tomimaro Hasebe (Mito Branch of Hitachi Works, Hitachi, Ltd., Katsuta-cho, Ibaragiken, Japan). Progr. Theoret. Phys. (Japan) 12, 403-6(1954) Sept.

NUCLEAR PROPERTIES

2003

REGARDING NUCLEAR TEMPERATURES. A. Tomasini. Translated from Nuovo cimento 12, 134-9(1954). 6p. Available from Associated Technical Services, East Orange, N. J. (AEC-tr-2058)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-5758.

2004

HALF-LIFE OF YTTRIUM-90. Herbert L. Volchok and J. Laurence Kulp (Lamont Geological Observatory, Palisades, N. Y.). Phys. Rev. 97, 102(1955) Jan. 1.

A series of determinations on the half life of Y^{90} have been made, resulting in an average value of 64.24±0.30 hours. Y^{90} was separated from its Sr^{90} mother by either a carbonate or phosphate precipitation, followed by conversion to oxalate as the final counting vehicle. The efficiency of the chemical separations, precision of the determinations, and good agreement with the latest published results suggest that the half life of this nuclide is now known to accuracy of 0.7%. (auth)

2005

HYPERFINE SPLITTING AND THE SIGN OF THE MAGNETIC MOMENT OF Cs^{134m}. L. S. Goodman and S. Wexler (Argoone National Lab., Lemont, Ill.). Phys. Rev. 97, 242 (1955) Jan. 1.

Previously published low-frequency data (Cohen and Gilbert, Phys. Rev. 95, 569(1954); Goodman and Wexler, Phys. Rev. 95, 570(1954)) from magnetic resonance experiments with 3.1-hr Cs^{134m} atomic beams, when correctly substituted in the Breit-Rabi equation, yield a hyperfine splitting $\Delta\nu = 3684.3 \pm 0.5$ Mc/sec if a positive nuclear magnetic moment is assumed, and $\Delta\nu = 3695 \pm 0.5$ Mc/sec if this magnetic moment is taken to be negative. The present note reports a direct hyperfine transition is Cs^{134m} at 3684.5 ± 0.5 Mc/sec. It is concluded that the previous data and the present measurement are consistent only with the assumption of a positive nuclear magnetic moment. (L.T.W.)

2006

NUCLEAR HYPERFINE STRUCTURE INTERACTION IN 3.1-hr Cs^{134m}. D. A. Gilbert and Victor W. Cohen (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 97, 243 (1955) Jan. 1.

A magnetic resonance atomic beam experiment on 3.1-hr Cs^{134m} to observe the transitions $\Delta F = \pm 1$ is reported. (L.T.W.)

2007

MASS SPECTRUM OF ELEMENTARY PARTICLES. II. Hiroshi Enatsu (Kyoto Univ., Japan). Progr. Theoret. Phys. (Japan) 12, 363-79(1954) Sept. (cf. NSA 8-5072)

Considerations of the mass spectrum of elementary particles are presented. The eigenvalue problem of the mass of a Dirac particle is discussed. The mass eigenvalues of the Dirac particle which interacts with itself through scalar photon fields are estimated by a method similar to that developed in the case of a deuteron for a Yukawa well. The ambiguities which appear in the calculation of the nucleon self-energy caused by scalar mesons with vector coupling are discussed. It is shown that, in spite of the ambiguities, we may assume a fermion ($\sim 2350 m_e$) and a scalar cohesive meson ($\sim 1100 m_e$) to get convergence of the nucleon self-energy due to π mesons. A brief survey of the model of heavy particles which seems to be qualitatively consistent with the recent experimental results is also given. (auth)

2008

INVESTIGATION OF THE ENERGY LEVELS OF SILICON NUCLEI BY THE MAGNETIC ANALYSIS METHOD. L. M. Khromchenko. Doklady Akad. Nauk S.S.S.R. 98, 761-3(1954) Oct. 21. (In Russian)

Si of natural isotopic composition was bombarded with monoenergetic 4.4-Mev deuterons. The resulting energy spectra are shown, and the following energy levels of Si^{29} were measured: 1.237, 2.038, 2.416, 3.083, 3.662, (4.223), 4.931, 5.944, (6.138), 6.453, 6.728, 7.000, 7.577, 7.820, 8.354, 8.832, and (9.112). Q_0 for the $Si^{28}(d,p)Si^{29}$ reaction was found to be 6.229 Mev. (G.Y.)

2009

MULTIPLE PION PRODUCTION THROUGH ISOMERIC STATES OF THE NUCLEON. THEOREMS FOLLOWING FROM CHARGE INDEPENDENCE. R. Gatto (Univ. of Rome, Italy). Nuovo cimento (10) 1, 159-73(1955) Jan. (In English)

Some interpretations of the scattering and of the multiple production of pions based on the hypothesis of the intervention of isomeric states of the nucleons have recently been proposed. There are indications that this situation occurs, at least approximately, in certain energy ranges. Such a simplified interpretation of the complex phenomenon of multiple production may be insufficient, but on account of the importance of the problem it may nevertheless be useful to examine the main consequences. Multiple production in meson-nucleon, gamma-nucleon and nucleon-nucleon collisons is considered here. If the hypothesis is made that each time only the matrix elements corresponding to a given value of the total isotopic spin predominate, general relations can be obtained for the average numbers of pions of each sign produced which are independent of the multiplicity. (auth)

2010

ANGULAR CORRELATION OF ELECTRON PAIRS FROM 3.09-MEV γ RADIATION OF CARBON 13. MEASUREMENT OF THE MULTIPOLARITY OF THIS RADIATION. Serge Gorodetzky, Raymond Armbruster, Pierre Chevallier, and André Gallmann. Compt. rend. 239, 1623-5(1954) Dec. 8. (In French)

2011

NUCLEAR MAGNETIC RESONANCE IN LIQUIDS UNDER HIGH PRESSURE. G. B. Benedek and E. M. Purcell (Harvard Univ., Cambridge, Mass.). J. Chem. Phys. 22, 2003-12 (1954) Dec.

The work reported is an application of free precession or "spin echo" techniques in nuclear magnetic resonance to a study of the properties of liquids under high pressure. The proton relaxation time T_1 was measured as a function of pressure, over the range 1 to 10 000 atmospheres, for six liquids: n-pentane, n-hexane, toluene, ethyl iodide, and methyl iodide. In addition to the relaxation time, the normalized values D (P) / D (1) of the self-diffusion constant were measured as a function of pressure for water and methyl iodide. In each liquid T_1 decreases with increasing pressure. However, comparison of the observed variation of T_1 with pressure with Bridgman's data on the variation of viscosity η with pressure shows in all cases (except that of methyl iodide for which no viscosity data are available) that T_1 is not simply proportional to $1/\eta$, but instead $T_1\eta$ increases with pressure. Similarly, for water and methyl iodide, the diffusion constant D varies in such a way that T_1/D increases with pressure. For water the Stokes-Einstein relation $D\eta = cT$ is obeyed within the errors of observation. The behavior of T_1 can be understood if one assumes that the dominant relaxation mechanism involves intramolecular fields, whose correlation time is determined by the rotational freedom of the molecule, and that compression of the liquid inhibits migrational freedom more drastically than rotational freedom. The necessity of making the present measurements has led to the discovery that BeCu, a heat treatable alloy, makes a very satisfactory high pressure, nonmagnetic bomb which might well be used for other magnetic investigations under high pressure. (auth)

2012

NUCLEAR QUADRUPOLE RESONANCES IN BROMOBENZENE DERIVATIVES. P. J. Bray (Rensselaer Polytechnic Inst., Troy, N. Y.) and R. G. Barnes (Univ. of Delaware, Newark). J. Chem. Phys. 22, 2023-5(1954) Dec.

The pure nuclear quadrupole resonance frequencies of the Br^{79} isotope are given for a number of previously unreported bromobenzene derivatives. The resonance frequencies of the Br^{81} isotope in these and other previously reported compounds are compared with the electron density in the vicinity of the carbon atom to which the bromine is bonded. (auth)

2013

ON A UNIVERSAL SCHEME FOR THE OBSERVATION OF THE MAGNETIC RESONANCE OF ATOMIC NUCLEI. S. D. Gvozdover and N. M. Ievskaya. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 4, 435-40(1953). (In Russian)

In order to combine the advantages of the bridge-type and the 2-coil type magnetic resonance circuits (in which the final adjustment is achieved by balancing the bridge and by mechanical methods, respectively) a simple circuit was devised, consisting of a resistance, 3 fixed and 3 variable condensers, connected to the two coils surrounding the sample. The final balancing is achieved by tuning the circuit. The theory of the methods is given. Tests showed the method to work both for weak and strong high-frequency fields, which makes possible the observation of the "inversion" of the vector of magnetization. (Science Abstracts)

NUCLEAR REACTORS

2014

AN ELECTRICAL MODEL OF A NUCLEAR REACTOR. Carlos Vélez Ocón. Rev. mex. fis. 3, 229-35(1954) Oct. (In Spanish)

An electric analog circuit for reproducing the tansfer function of a nuclear is discussed. Two circuits based on symmetric lattices are proposed, but the problem has numerous solutions, and the choice depends upon the applications considered. (tr-auth)

2015

TEMPERATURE RISE IN A THERMAL REACTOR AS A RESULT OF COOLING. R. Schulten and H. Gaus (Max-Planck-Institut fur Physik, Göttingen, Germany). Z. Naturforsch. 9a, 1039-43(1954) Dec. (In German)

A formula for the maximum possible temperature rise within a thermal reactor as a result of cooling is derived. (tr-auth)

NUCLEAR TRANSFORMATION

2016

Los Alamos Scientific Lab.

EXCITATION FUNCTION OF $O^{16}(t,n)F^{18}$. Nelson Jarmie. Oct. 1, 1954. 8p. Contract W-7405-eng-36. (LA-1736)

The excitation function for the reaction $O^{16}(t,n)F^{18}$ for bombarding energies of 0.680 to 2.130 Mev is reported. (auth)

2017

STUDY OF THE NUCLEAR REACTION $Be^9(n,2n)Be^8$. V. I. Mamasakhlisov. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 1, 36-9(1953). (In Russian)

The incident neutron is taken as free and the final neutron in Be^9 is assumed to move in a P state in a square well of depth 12 Mev and radius 5×10^{-13} cm. The interaction between these two neutrons is assumed to be of a δ-function character. The two off-coming neutrons are taken to be free. The cross section obtained is $\sigma \simeq 0.08 \times 10^{-24}(\gamma-1)^2/\gamma^{1/2}$ cm^2, where $\gamma = E/\epsilon, \epsilon$ is the binding energy of the final neutron in Be^9, and E is the energy of the incident neutron. This is in reasonable agreement with experiment. (Science Abstracts)

2018

PHOTO-DISINTEGRATION OF THE DEUTERON BY HIGH ENERGY γ-RAYS. A. M. Korolev. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 2, 188-90(1953). (In Russian)

The electromagnetic field is coupled not only to the nucleons as in the phenomenological theory but also with mesons in intermediate states. (Pseudoscalar mesons are employed with pseudoscalar and pseudovector coupling to the nucleons.) Qualitative agreement with the slow decrease of the experimental cross section up to 140 Mev and the rise beyond that point is obtained with the pseudovector coupling. (Science Abstracts)

2019

ANGULAR DISTRIBUTION OF GAMMA RAYS FROM PROTON CAPTURE IN B^{11}. H. E. Gove and E. B. Paul (Atomic Energy of Canada Limited, Chalk River, Ontario). Phys. Rev. 97, 104-8(1955) Jan. 1.

The γ-ray yield at 90° from the bombardment of B^{11} by protons shows resonances for proton energies of 0.67, 1.4, and 2.7 Mev. The angular distributions of the two γ rays of high energy, $\gamma_0 \sim 17$ Mev and $\gamma_1 \sim 12$ Mev, have been measured at these resonances to obtain evidence concerning the spins and parities of the excited nucleus. The evidence favors 2− for the 0.67-Mev resonance, 1− for that at 1.4 Mev, and 2+ at 2.7 Mev, but these assignments cannot be made with certainty. (auth)

2020

ANGULAR DISTRIBUTION OF PROTONS FROM THE REACTION $Ti^{48}(d,p)Ti^{49}$. William W. Pratt (State Univ. of Iowa, Iowa City). Phys. Rev. 97, 131-2(1955) Jan. 1.

The angular distribution has been measured for transitions to excited states in Ti^{49} at 1.40 and 1.74 Mev. The deuteron energy was 2.6 Mev. The angular distributions are characterized by a peak at about 75° angle of proton emergence with respect to the deuteron beam direction. These results are suggestive of a stripping reaction with significant Coulomb effects. A rough determination of absolute cross section values gives 0.05, 0.57, 0.35, and 0.2 mb, respectively, for transitions to the ground state and excited states at 1.40, 1.74, and 2.45 Mev in Ti^{49}. (auth)

2021

AVERAGE NUMBER OF NEUTRONS EMITTED DURING THE SPONTANEOUS FISSION OF Cf^{252}. W. W. T. Crane, G. H. Higgins, and S. G. Thompson (Univ. of California, Livermore). Phys. Rev. 97, 242(1955) Jan. 1.

The average number of neutrons per spontaneous fission of Cf^{252} has been found to be 3.10 ± 0.15 by the manganous sulfate moderator-absorber system. (L.T.W.)

PARTICLE ACCELERATORS

2022

Ames Lab.

A METHOD FOR THE PROMPT DESTRUCTION OF THE ELECTRON BEAM IN A CONVENTIONAL SYNCHROTRON. [PART 1]. C. L. Hammer and A. J. Bureau. Dec. 28, 1954. 17p. Contract W-7405-eng-82. (ISC-558)

By passing current through coils wrapped around a section of the donut of a synchrotron it is possible to change the fall off index of a part of the guide field while leaving the remaining guide field unaltered. This technique is used on the Iowa State College 70 Mev synchrotron, and complete beam destruction is found experimentally to occur in less than 0.2 μsec. The build-up of the radial oscillation is analyzed and it is estimated that complete destruction of the beam is accomplished in approximately 10 revolutions or 0.06 μsec. The analysis also shows that this technique can be a valuable aid in the extraction of an electron beam from a synchrotron or betatron. (auth)

2023

Ames Lab.

A METHOD FOR THE PROMPT DESTRUCTION OF THE ELECTRON BEAM IN A CONVENTIONAL SYNCHROTRON. [PART] 2. C. L. Hammer and A. J. Bureau. Jan. 13, 1955. 9p. Contract W-7405-eng-82. (ISC-561)

The analysis of the betatron oscillations of a two-sector synchrotron is generalized to apply to positions in the synchrotron other than the center of the perturbed sector. In this manner the azimuthal position of the maximum radial displacement of the electrons is found. This analysis is used to find the optimum position of the internal target with respect to the perturbing coils. (auth)

2024

STRONG FOCUSING IN LINEAR ION ACCELERATORS. Michel-Yves Bernard. Ann. phys. 9, 633-82(1954) Nov.-Dec. (In French)

Theoretical and experimental relationships are derived for strong focusing in linear accelerators designed for fast heavy particles. (K.S.)

2025

DESIGN AND INITIAL OPERATION OF A 50-MEV MICROWAVE LINEAR ACCELERATOR FOR ELECTRON BEAM THERAPY. Lester S. Skaggs, John C. Nygard, and Lawrence H. Lanzl (Argonne Cancer Research Hospital, Chicago, Ill.). Radiology 64, 117(1955) Jan.

RADIATION ABSORPTION AND SCATTERING

2026

Research Foundation, Ohio State Univ.

THE STOPPING CROSS SECTIONS OF METALS FOR PROTONS OF ENERGIES FROM 400 TO 1000 KEV. D. Wayne Green, John N. Cooper, and James C. Harris. [1954]. 22p. Contract [AT(11-1)-147]. (AECU-2975)

The stopping cross sections of Mu, Cu, Ge, Se, Ag, Sn, Sb, Au, Pb, and Bi are reported for protons in the energy range 400 to 1000 kev. The cross sections are roughly proportional to the square root of the atomic number of the stopping element and inversely proportional to the velocity of the incident protons. There is some evidence that the stopping cross section increases more rapidly than $Z^{1/2}$ as the various p shells are filled. (auth)

2027

Consolidated Aircraft Corp.
AIR AND GROUND SCATTERING OF Co^{60} GAMMA RAYS IN A SHADOW SHIELD GEOMETRY. L. V. Woodruff, J. W. Harris, and W. P. Kunkel. Dec. 16, 1953. 10p. (CVAC-198T; MR-A-336)

The variation in scattered dose rate from a Co^{60} source as a function of shadow shield angle is ascertained. The shadow shield employed was the container for the source. Shadow shield half angles of 8, 9, 10, 11, 12, 16, 22, 35, and 66° were investigated. The source-to-detector separation was held constant at 64.5 ± 0.25 ft., and both were 11.1 ft above the ground. The results are graphically presented. (K.S.)

2028

Consolidated Vultee Aircraft Corp.
SINGLE SCATTERING OF NEUTRONS IN AIR. G. S. Weller and B. J. Workman. Jan. 22, 1954. Revised Sept. 17, 1954. 25p. (CVAC-211T; MR-N-5)

Single-scattering assumptions have been made using a point isotropic source and a point nondirectional detector in an infinite medium with no restricted angles. Two integrations of the triple integral which results have been performed by direct integration over the azimuthal angle between the limits of 0 to 2 π and numerical integration over the angle at the receiver between the limits of zero and the scattering angle. The result is an integral over the scattering angle of the form:

$$\int_0^{\pi} \left(\frac{d\sigma}{d\Omega}\right)_{\theta} K(a\Sigma_s, \theta)\, d\theta,$$

where $(d\sigma/d\Omega)_{\theta}$ is the differential scattering cross-section for either neutrons or gamma rays and $K(a\Sigma_s, \theta)$ is the result of the two completed integrals. The integral is general for the assumptions that have been made and for a given value of a Σ_s and has been evaluated using both an isotropic and angular differential scattering cross-sections for values of a Σ_s from 0.1 to 1.0 for 0.3, 1.0, and 3.0 Mev neutrons. Modification of the differential scattering cross sections has been made to obtain energy flux and dosage at the receiver for 1.25 Mev gamma rays. (auth)

2029

Consolidated Vultee Aircraft Corp.
MULTIPLE SCATTERING OF NUCLEAR RADIATION. E. Leigh Secrest. Jan. 8, 1954. 28p. (CVAC-212T; MR-N-1)

A systemic approach to scattering calculations for point sources in infinite media has been outlined. This model classifies successive approximations to the complete scattered dose according to single collision flux, double collision flux, etc. Numerical calculations are presented for isotropic scattering with a definite average energy loss per collision. It is shown that the single collision model can give either an underestimate or an overestimate of the scattered flux. The dependence of this effect on cross section and separation distance is demonstrated. The calculations cover a range of separation values from 0 to 5 mean free paths (for the source energy). (auth)

2030

Consolidated Vultee Aircraft Corp.
REPORT ON THE EXPERIMENTAL DATA OBTAINED WITH THE 2 π SHIELD. B. P. Leonard, W. P. Kunkel, L. V. Woodruff, and J. W. Harris. Jan. 15, 1954. 38p. (CVAC-219T; MR-A-318)

The necessity for performing structural scattering experiments near the ground has led to a search for a means of eliminating ground scattering from the results. It was thought probable that, in the case of the Co^{60} experiments, a 2 π source shield might prove effective. This experiment was performed to determine the effect of placing a Co^{60} source at the center of a square lead shield 4-in. thick and 24 in. on a side. Specifically, it was desired to determine: (1) the sharpness of the reduction in dose rate at the edge of the shield (at the surface joining the shielded and the unshielded hemispheres), (2) the dose rate in the shielded hemisphere and (3) the ratio of the dose rates due to the back-scattered and the direct radiation at various positions in the unshielded hemisphere. The reduction in dose rate at the edge of the shield was observed to be extremely sharp, going from a maximum to background in slightly more than 2°. The dose rates recorded at several positions in the shielded hemisphere were at the background level. The ratio of the dose rates due to radiation scattered from about 1.5% to slightly less than 5%. (auth)

2031

Nuclear Development Associates, Inc.
INTEGRAL TERM FOR ELASTIC SCATTERING OF PARTICLES. J. Certaine. July 13, 1953. 17p. Contract AT(30-1)-862. (NDA-15C-12)

The integral term for elastic scattering of particles is obtained. The equivalence between neutron and photon scattering is established, and results on photon scattering are applied to obtain the equation satisfied by first and higher scattered neutrons flux from a plane isotropic source. Equations satisfied by plane and point isotropic moments are also obtained. (auth)

2032

RADIATION OF γ-RAYS UPON COLLISION OF FAST π-MESONS WITH NUCLEONS. L. D. Landau and I. Ya. Pomeranchuk. Zhur. Eksptl'. i Teoret. Fiz. 24, No. 5, 505-15(1953). (In Russian)

The bremsstrahlung of γ rays is calculated for π mesons which are absorbed by a "black" nucleon and, therefore, produce diffraction scattering. For large energies, $E \gg \mu$, where μ is the π-meson rest energy, it is shown that only the region outside the nucleon contributes appreciably to this process, and the π-meson wave function is known in this region as a sum of plane waves and diffracted waves. Radiation accompanying the capture of the π meson is also calculated. The differential cross-section for radiation is found to be small compared to πR^2 except for small angles, $\theta < \mu/E$, where it becomes large with increasing energy. (Science Abstracts)

2033

ATOMIC FACTORS OF ELECTRON SCATTERING. B. K. Vainshtein. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 2, 157-68 (In Russian)

The form factor for electron scattering, i.e., $f_{el}(s) = K \int \phi(r) e^{isr}\, d\tau$, where φ is the electrostatic potential of the atom plus screening electrons, is calculated for all elements and values of s. For light elements results are taken from other calculations; for medium and heavy elements, the Thomas-Fermi electron distribution is used to define φ. (Science Abstracts)

2034

ON THE SCATTERING OF π-MESONS BY NUCLEONS. V. P. Silin. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 2, 255-6(1953). (In Russian)

The experimental data for the scattering of mesons in the $S_{\frac{1}{2}}$ state determine only two parameters (scattering length a and range of force r_0) in a phenomenological theory. With a particular choice of $a = 0.3\hbar/\mu c$ and $r_0 = 1.05\hbar/\mu c$, agreement with experiment is obtained. (Science Abstracts)

2035

THE COMPTON SCATTERING OF A CIRCULARLY POLARIZED QUANTUM BY AN ELECTRON WITH A GIVEN SPIN DIRECTION. G. M. Gandel'man. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 4, 429-34(1953). (In Russian)

The differential cross sections in the range 0 to 180° for left and right circularly polarized quanta are worked out by the Feynman method. The results are tabulated in a form convenient for comparison with experiment, for photon energies mc^2 and $4mc^2$. The cross sections are also plotted as functions of the angle of the recoil electron (ϕ) for the scattering by the electrons in magnetized Fe (assumed electron spin alignment given by 14.1 positive to 11.9 negative spins per Fe atom). They increase with decreasing ϕ, the ratio of σ (spin || to photon momentum) to σ (antiparallel) at $\phi = 180°$ being ~10 for energy mc^2 and ~100 for energy $4mc^2$. (Science Abstracts)

2036

DIRECTION OF POLARIZATION OF PROTON SPIN PRODUCED BY ELASTIC SCATTERING. L. Marshall and J. Marshall (Univ. of Chicago, Ill.). Nature 174, 1184-5(1954) Dec. 25.

An experiment is described for measuring the direction of polarization of a 435-Mev 60% polarized proton beam produced by elastic scattering from a Be target. The protons were slowed down in a Cu attenuator, and those in the 0- to 20-Mev energy region were collimated before passing into a He scattering chamber. Ilford E1 emulsions were placed to the right and left in the chamber in such a way that protons scattered by the collimating system could not reach them and protons scattered in the horizontal plane and at ± 90° to the beam entered the emulsion in a direction normal to the surface. The results for polarization downward show that right-hand scattering is stronger than left-hand scattering near 3 Mev, whereas the reverse is true at 7 to 11 Mev. It is tentatively concluded that the proton beam incident on He is polarized with spin down. The conclusions reached from the experiment are in agreement with the proposal that the polarization is due to spin orbit coupling effective in nuclear shell structure. (K.S.)

2037

ELASTIC SCATTERING OF FAST PROTONS AND DEUTERONS. K. B. Mather (Univ. of Melbourne, Australia). Atomics 6, 21-8(1955) Jan.

The current state of p,d and n,d scattering physics is reviewed in connection without theoretical and experimental understanding of nuclear forces. (K.S.)

2038

THE ABSORPTION OF X RADIATION IN LIVING TISSUE. H. R. Schinz and H. Waffler. Fortsch. Gebiete Rontgenstrahlen 81, 804-11(1954) Dec. (In German)

The physical elementary processes underlying absorption of soft (200 kev), hard (2 Mev), and ultrahard (20 Mev) x radiation in water and tissue are described and presented graphically. Photoeffect, pair formation, and nuclear processes are discussed. (tr-auth)

2039

SLOWING DOWN OF POLARIZED PROTONS. E. Heiberg, U. Kruse, J. Marshall, L. Marshall, and F. Solmitz (Univ. of Chicago, Ill.). Phys. Rev. 97, 250-1(1955) Jan. 1.

A 54%-polarized proton beam was produced by scattering 435-Mev circulating protons elastically at 14° from a Be target in a cyclotron. The polarization was determined by measuring the asymmetry of elastic scattering from Be at the same angle. In addition, the asymmetries of elastic scattering at 20 and 30° were measured in a geometry subsequently used to measure asymmetries for the beam degraded in energy. The beam was degraded to E′ in paraffin, C, Cu, and Pb, and the asymmetry of elastic scattering by Be again measured at 20 and 30°. The geometry was such that no protons scattered by more than 2.2° in the slowing-down material could reach the Be. In passing through the 2-in. thick Be scatterer, the mean energy of the beam was still further reduced from E′ to E, and the emergent energy determined. A table of data shows the effective energy E, the thicknesses of various attenuators, and the corresponding asymmetries of elastic scattering measured at the two lab. angles. Additional data in a plot show the polarization of 425-Mev protons elastically scattered from Be as a function of lab. angle. Results indicate that for the energy range used no small-angle interactions affect depolarization. (L.M.T.)

2040

IMPORTANCE OF INELASTIC $\beta-e^-$ DIFFUSION IN RADIOACTIVE SOURCES. Maurice Duquesne. Compt. rend. 239, 1785-6(1954) Dec. 20. (In French)

It has been previously shown that the retrodiffusion of β particles by Geiger-Mueller counters cause a perturbation in $\beta-e^-$ coincidence measurements, and a method was described for obtaining the coincidence rate with a radioactive source as the origin. The inelastic $\beta-e^-$ diffusion in the source material is also shown to produce parasitic coincidences. (tr-auth)

2041

BACKSCATTERING FROM TARGETS OF LOW ATOMIC NUMBER BOMBARDED WITH 1-2 MEV ELECTRONS. Jerome Saldick and Augustine O. Allen (Brookhaven National Lab., Upton, N. Y.). J. Chem. Phys. 22, 1777(1954) Oct.

In a recent article (J. Chem. Phys. 22, 438(1954)) the fraction of high-energy secondaries was estimated, including deflected primaries together with true high-energy secondaries, which scattered back from an aqueous solution bombarded with perpendicularly incident 1- and 2-Mev electrons. In the present paper data are given for targets of Mg, C, Be, and (1 Mev only) Li. Calculations are reported for high-energy secondaries as a fraction of total primary beam for 0.8N H_2SO_4 solutions. Results showed that the fraction increases nonlinearly with Z in the range of low Z. Data are compared with previous results on thick targets of Al, Fe, W, Pt, and Pb. (This abstract replaces NSA 9-413 which contains erroneous information.) (J.A.G.)

2042

POLARIZATION OF VERY FAST NEUTRONS BY SCATTERING ON HEAVY NUCLEI. I. I. Levintov (Institute of Chemical Physics, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 98, 373-6(1954) Sept. 21. (In Russian)

Fermi's calculations (cf. NSA 8-3547) on the polarization of protons of several hundred Mev energy by scattering from light nuclei are extended to scattering from heavy nuclei of zero spin. A quasiclassical approximation is used to calculate the polarization of 300 Mev neutrons on Pb. (G.Y.)

2043

PASSAGE OF CHARGED PARTICLES THROUGH MAGNETIC MATERIALS. A. G. Sitenko. Doklady Akad. Nauk S.S.S.R. 98, 377-80(1954) Sept. 21. (In Russian)

Equations are derived for the effect of magnetic material on the emission of Cherenkov radiation by charged particles traversing it. (G.Y.)

2044

KINEMATICAL INVESTIGATIONS OF MESON-NUCLEAR REACTIONS. Satio Hayakawa, Masaaki Kawaguchi, and Shigeo Minami (Kyoto Univ. and Osaka Univ., Japan). Progr. Theoret. Phys. (Japan) 12, 355-62(1954) Sept.

The angular distribution and the polarization of recoil nucleons for meson-nucleon scattering as well as photomeson production are studied from the kinematical point of view. Similar to the case of meson-nucleon scattering, there exists a simple symmetry property also in the photomeson production. The angular distribution is invariant under the simultaneous interchange of the reaction amplitudes of electric and magnetic radiations with the same multipole order and the same total angular momentum. This interchange upsets the sense of the polarization of recoil nucleons. For practical purposes the tables of the angular distribution and the polarization are given for J's up to $\frac{3}{2}$. (auth)

2045

A CAVITY IONIZATION THEORY INCLUDING THE EFFECTS OF ENERGETIC SECONDARY ELECTRONS. L. V. Spencer and Frank H. Attix (National Bureau of Standards, Washington, D. C.). Radiology 64, 113(1955) Jan.

The energy dissipated per unit mass in air was calculated relative to wall materials of C, Al, Cu, Sn, and Pb irradiated by Co^{60} γ radiation. The role of secondary electrons is discussed, and modifications are proposed in the Bragg-Gray theory of cavity ionization. (C.H.)

2046

BROAD BEAM ATTENUATION OF 70-250 KV.P. X-RAY BEAMS IN ALUMINUM. E. Dale Trout, John P. Kelley, Arthur C. Lucas, and Edward J. Furno. Radiology 64, 114 (1955) Jan.

The attenuation of x radiation produced by pulsating voltages of 70, 100, 125, 150, 200, and 250 kvp was measured in commercially pure Al, and results are applied to computations of the thickness of concrete needed for shielding. (C.H.)

2047

DOSE TO WALLS IN RADIOGRAPHIC ROOMS. Scott W. Smith and Robert J. Kennedy (National Bureau of Standards, Washington, D. C.). Radiology 64, 114-15(1955) Jan.

Preliminary results are presented from a survey of the radiation actually reaching the walls in radiographic rooms in a number of installations. Requirements for protective materials for radiographic rooms are discussed briefly. (C.H.)

2048

INTERFERENCE EFFECTS IN THE TOTAL NEUTRON SCATTERING CROSS-SECTION OF CRYSTALS. G. Placzek and L. Van Hove (Institute for Advanced Study, Princeton, N. J.). Nuovo cimento (10) 1, 233-56(1955) Jan. (In English)

A general discussion is given for the interference effects in the total neutron scattering cross section of crystals. The limiting cases of short and long wavelengths are examined in detail. The inadequacy of the Debye approximation for quantitative calculation of the long wavelength interference term is emphasized. (auth)

2049

HIGH ENERGY ELECTRON SCATTERING BY POLARIZED NUCLEI. S. Ferroni and S. Fubini (Univ. of Torin, Italy). Nuovo cimento (10) 1, 263-5(1955) Jan. (In English)

A theoretical solution of the elastic scattering problem for high-energy electrons by polarized nuclei is attempted without explicitly solving the Dirac equation for assymetric charge distribution. An expression for the angular distribution effect is derived, and this is used to calculate the azimuthal effect for Ta^{181}. An effect of the order of 40% is obtained, using the Born approximation. The numerical result is not considered reliable because of the inadequacy of the Born approximation for problems of this type. (K.S.)

RADIATION EFFECTS

2050

Phillips Petroleum Co. Atomic Energy Div.
GAMMA-RAY DOSAGE RATE MEASUREMENT. C[alvin] H. Hogg. Nov. 22, 1954. 17p. Contract AT(10-1)-205. (IDO-16205)

The methods of measuring gamma-ray dosage in the gamma facility at the MTR site are described in this report. Data from three types of detectors—an aluminum calorimeter, an ion chamber, and a ceric sulfate dosimeter—are presented. It is shown that the three detectors give essentially the same value of dosage. (auth)

2051

Bausch and Lomb Optical Co.
IRRADIATION DAMAGE TO GLASS. Norbert J. Kreidl and J. Raymond Hensler. Nov. 1, 1954. 99p. Contract AT(30-1)-1312. (NYO-3780)

Silicate and phosphate glasses exposed to gamma radiation develop a visible absorption similar to the F-band developed in alkali halide crystals. In optical glasses this decrease in transmission prevents their use under exposure conditions. Cerium in the glass prevents this coloration. Five conventional optical glasses containing cerium were developed, maintaining the optical constants, high quality, and good color while "protecting" them against exposure to 10^8 roentgens. Effects of other elements on radiation damage are reported. Optics and instruments utilizing these glasses were developed and tested, particularly a stereo relay system, a remote viewing microscope. (J.E.D.)

2052

CHANGE OF SURFACE PROPERTY BY α RADIATION. Cestmir Jech. Z. physik. Chem. (Leipzig) 203, 309-11(1954) Oct. (In German)

2053

APPLICATIONS OF HIGH-ENERGY ELECTRONS TO THE STERILIZATION OF PHARMACEUTICALS AND THE IRRADIATION OF PLASTICS. C. W. Miller (Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, England.). J. Brit. Inst. Radio Engrs. 14, 637-52(1954) Dec.

The sterilization of pharmaceutical products and the variation of the physical properties of certain plastics by the action of ionizing radiations is described. It is shown that most efficient use of the available energy is made if electron bombardment is used in preference to x or gamma radiation. It is also shown that for the present time high-energy

electrons are best obtained from some form of accelerator rather than from radioactive sources. In particular the linear accelerator forms a very convenient source. Experiments using a linear accelerator are described and the economics of the process shown to be attractive. (auth)

RADIOACTIVITY

2054

Mound Lab.

A SIMPLIFIED PROCEDURE FOR COMPUTING THE GROWTH OF RADIOACTIVE DECAY PRODUCTS. H. W. Kirby and D. A. Kremer. May 10, 1954. 19p. Contract AT-33-1-GEN-53. (MLM-970)

A method for calculating the growth of radioactive decay products is described which reduces the labor of computation. This method is valuable when the decay chain is long, as in the radium, thorium, actinium, and neptunium series. By a suitable rearrangement, Bateman coefficients are expressed in a modified form so that these coefficients may be evaluated by means of tables. Examples showing use of the tables are given. (auth)

2055

LONG-LIVED ISOMER OF Np^{236}. M. H. Studier, J. E. Gindler, and C. M. Stevens (Argonne National Lab., Lemont, Ill.). Phys. Rev. 97, 88(1955) Jan. 1.

A long-lived isomer of Np^{236}, identified by chemical and mass spectrometric means, has been prepared by the U^{238} (d,4n) reaction. The alpha half life of this isomer has not been established but a lower limit of 5000 years has been placed on the beta half life. The cross section for the U^{238} (d,4n)$Np^{236,236*}$ reaction for 21.6-Mev deuterons has been calculated to be approximately 35 millibarns. A slow neutron fission cross section of 2800 barns has been determined for the long-lived isomer. (auth)

2056

RADIOACTIVITY OF In^{117} AND Sb^{117}. Carl L. McGinnis (National Bureau of Standards and National Research Council, Washington, D. C.). Phys. Rev. 97, 93-7(1955) Jan. 1.

The $p_{1/2}$ isomeric level of In^{117} decays with a 1.9-hr half life 49 % by a 1.777-Mev β^- to the $S_{1/2}$ ground state of Sn^{117}, 23 % by a 1.616-Mev β^- to the 0.161-Mev $d_{3/2}$ level of Sn^{117}, and 28 % by an M4 0.311-Mev γ to the $g_{9/2}$ ground state of In^{117}. The latter decays with a 1.1-hr half life by a 0.740-Mev β^- to the $g_{7/2}$ level of Sn^{117} which is de-excited by a 0.565-Mev γ and a 0.161-Mev γ in cascade. There is no crossover γ (< 1 %). Less than 10 % of the 3.0-hr Cd^{117} decays to the 1.9-hr level. Less than 1% of the 1.1-hr ground state populates the 14-day Sn^{117m}. The 2.8-hr Sb^{117} decays to the 0.161-Mev level of Sn^{117} by a 0.61-Mev $\beta^+(\beta^+/\epsilon = 0.026)$ but does not decay to the 0.323- or 0.726-Mev levels (<0.5%). (auth)

2057

DECAY SCHEME OF THE MIRROR NUCLEUS P^{29} AND RELATED RESULTS. H. Roderick, O. Lonsjo, and W. E. Meyerhof (Stanford Univ., Calif.). Phys. Rev. 97, 97-101 (1955) Jan. 1.

The decay of P^{29} has been investigated with scintillation spectrometers, single and in coincidence. Positron emission (3.945±0.05 Mev end-point energy for the most energetic spectrum) occurs with a half life of 4.45±0.05 sec to the ground state and to excited levels of Si^{29} at 1.28, 2.43, and possibly 2.03 Mev. Branching ratios (in percent) of 98.8± 0.4 (ground state), 0.8±0.2 (1.28-Mev level), < 0.15 (2.03-Mev level), and $0.24-_{0.09}^{+0.36}$ (2.43-Mev level) were measured. A study of γ rays from the decay of Al^{29} to Si^{29} led to branching ratios (in percent) of 15±9 (1.28-Mev level), <4 (2.03-Mev level), and 85±9 (2.43-Mev level). The intensity of a 1.15-Mev γ ray (cascading from the 2.43-Mev level) has been set at < 11% of the total Al^{29} decays. Spin and parity assignments of the Si^{29} levels are discussed and compared with the results of other experiments. The ft values of the P^{29} decay are shown to agree with values calculated from the coupling constants of β decay if the theories of Feenberg and Bohr are used. (auth)

2058

ENERGY LEVELS OF Hf^{177}. P. Marmier and F. Boehm (California Inst. of Tech., Pasadena). Phys. Rev. 97, 103-4 (1955) Jan. 1.

The nuclear spectrum of Lu^{177} has been investigated. Three excited levels of Hf^{177} have energies of 112.97, 249.69, and 321.33 kev. A decay scheme is proposed. (auth)

2059

ELECTRON-NEUTRINO ANGULAR CORRELATION IN THE BETA DECAY OF NEON^{19}. D. R. Maxson, J. S. Allen, and W. K. Jentschke (Univ. of Illinois, Urbana). Phys. Rev. 97, 109-16(1955) Jan. 1.

The electron-neutrino angular correlation in the beta decay of Ne^{19} has been measured by observing the energy spectrum of F^{19} recoil ions. The constant λ in the angular correlation function $[1+\lambda(v_e/c)\cos\theta_{ev}]$ was found to be $\lambda = -0.21\pm0.08$, indicating that the beta-decay interaction is of the form STP and not VTP. The observed angular correlation leads to the result

$$C_S^2|\int 1|^2 / C_T^2|\int\sigma|^2 = 0.69 \pm 0.17,$$

which is consistent with $C_S^2 \simeq C_T^2$ if the nuclear configuration is $(d_{5/2})^3_{1/2}$, but not if the configuration is $(s_{1/2})^3_{1/2}$. Most of the F^{19} recoils carried one unit of negative charge, but singly charged positive ions were also detected. The coincidence rate due to positive ions was about 10% of that due to negative ions. No doubly charged recoils were observed. (auth)

2060

STUDIES ON THE ISOMERIC PAIR, Nb^{89m} AND Nb^{89}. Hirdaya B. Mathur, Earl K. Hyde, Charles A. Levine, and Per K. Kofstad (Univ. of California, Berkeley). Phys. Rev. 97, 117-20(1955) Jan. 1.

By bombardment of zirconium, niobium, yttrium, and silver targets in the 184-inch cyclotron it has been possible to produce the isomer pair Nb^{89m} and Nb^{89}. The isomerism arises from the odd 41st proton below the 50-proton closed shell of the single-particle nuclear model. Nb^{89} ($g_{9/2}$) is a 1.9-hour activity emitting 2.85-Mev positrons to produce Zr^{89}. The yeild of the Nb^{89m} ($p_{1/2}$) is about 30–100 fold less and its radiations were not directly observed. By scintillation spectrometer measurements on zirconium daughter activity it is shown that Nb^{89m} decays with about a 2-hour half life to 4.4-minute Zr^{89m} ($p_{1/2}$). The M4 gamma transition between the two niobium levels is not observed, indicating that the level spacing is small and the upper level deactivates primarily by positron emission. The log ft values are larger than expected and are discussed in terms of the even-even core rearrangement considerations of A. De-Shalit and M. Goldhaber [Phys. Rev. 92, 1211(1953)]. Nb^{89} was also prepared by bombardment of NaBr with accelerated carbon ions in the 60-inch cyclotron. (auth)

2061

DECAY OF V^{49}. W. S. Lyon (Oak Ridge National Lab., Tenn.). Phys. Rev. 97, 121(1955) Jan. 1.

V^{49}, produced by proton bombardment of Cr, has been found to be a pure K-capture nuclide with < 0.05% β^+ branching or γ radiation; the half life is 334 ± 20 days. (auth)

2062

SUMMING STUDIES OF THE GAMMA RAYS FOLLOWING THE DECAYS OF Ba^{131}, Se^{75}, AND Ru^{106}. D. C. Lu, W. H. Kelly, and M. L. Wiedenbeck (Univ. of Michigan, Ann Arbor). Phys. Rev. 97, 139–42(1955) Jan. 1.

Coincidences between the gamma rays following the decays in Ba^{131}, Se^{75}, and Ru^{106} have been examined with the summing technique. The experimental evidences lead to a new decay scheme for Ba^{131}. Some discrepancies with previous investigations are found in Se^{75}, which leads to a revision of the decay scheme. (auth)

2063

GAMMA AND X-RADIATION IN THE DECAY OF Am^{241}. H. Jaffe, T. O. Passell, C. I. Browne, and I. Perlman (Univ. of California, Berkeley). Phys. Rev. 97, 142–50(1955) Jan. 1.

The decay scheme of Am^{241} is discussed in terms of new information on the conversion electrons, gamma rays, and L series x rays accompanying its alpha decay. The photons were measured with a scintillation spectrometer and a bent crystal spectrometer and the conversion electron spectrum was determined with a double focusing beta-ray spectrometer. (auth)

2064

ISOMERISM IN Al^{25}. R. W. Kavanagh, W. R. Mills, and R. Sherr (California Inst. of Tech., Pasadena). Phys. Rev. 97, 248–50(1955) Jan. 1.

It has been observed that the ratio of γ-ray to positron yield in the Mg^{25} (p,γ) reaction varies with bombarding energy (Kluyver et al. Phys. Rev. 94, 1795(1954)). This note describes experiments which confirmed this observation and which, by a new measurement of β-decay energy and γ spectra, established the location of the 6.7-sec state in Al^{25}. (L.M.T.)

2065

ANALYZING BETA ABSORPTION GRAPHICALLY TO IDENTIFY EMITTERS. John H. Harley and Naomi Hallden (New York Operations Office, A.E.C.). Nucleonics 13, No. 1, 32–5(1955) Jan.

A new method is described for determining the maximum β-ray energy of a sample isotope from absorption measurements. The logarithm of the transmission of the sample and a standard are plotted against each other for each absorber used. The slope of the resulting straight line is characteristic of the maximum β-ray energy of the sample. The curve can be uniquely determined with very few absorbers. The β energies of samples containing more than one isotope can be determined if the energies are appreciably different. The logarithmic plot of 2 samples of the same isotope or of 2 samples in which isotopes are present in the same proportion will have a unit slope. This makes the method valuable for determining impurities in radiochemical precipitates. (M.P.G.)

2066

RADON RELEASED FROM CONCRETE IN RADIANT HEATING. A. F. Gabrysh and F. J. Davis (Oak Ridge National Lab., Tenn.). Nucleonics 13, No. 1, 50(1955) Jan.

It has been determined that concrete made from shale containing U will leak Rn by gas diffusion through microfissures, especially when the concrete is warmed. In an 8 ft high room with a heated concrete floor 15 ft × 10 ft × 3 in. made from shale containing 0.008% U, it was calculated from experimental data that the air would contain 1.5×10^{-11} c of Rn per liter. Building materials having an average U concentraction of 0.004% and higher should be avoided in structures for human habitation. (M.P.G.)

2067

THE LITTLE HOTSPOT. MINIATURE Co^{60} GAMMA IRRADIATOR. W. S. Eastwood (Atomic Energy Research Establishment, Harwell, Berks, England). Nucleonics 13, No. 1, 52–3(1955) Jan.

A cylindrical γ source has been designed capable of providing dose rates greater than 10^6 rep/hr for specimens no larger than 13 mm in diameter. Radiation is reasonably uniform over an axial length of 2 cm. The source is composed of 8 cylinders containing Co^{60}. The cylinders are arranged in a ring within a lead-filled container having 8 in. wall thickness. The total activity of the source is 439 c. Doses outside the chamber are very small. The unit is compact, and the container could be made by an university workshop. (M.P.G.)

2068

SURVEY OF THE Zr^{95} + Nb^{95} RADIATIONS. P. P. Zarubin, Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 563–79(1954) Sept.–Oct. (In Russian)

The literature on the $Zr^{95} \rightarrow Nb^{95} \rightarrow Mo^{95}$ decay is reviewed in detail, the available data are compiled, and proposed decay schemes are compared. 38 references. (G.Y.)

2069

SURVEY OF THE Rb^{86} RADIATIONS. A. G. Dmitriev and P. P. Zarubin. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 580–8(1954) Sept.–Oct. (In Russian)

The literature on the β and γ spectra and decay schemes of Rb^{86} is reviewed. 24 references. (G.Y.)

2070

PROPORTIONAL COUNTER MEASUREMENT OF THE L CAPTURE/K CAPTURE RATIO OF Ge^{71}. Michel Langevin, Compt. rend. 239, 1625–7(1954) Dec. 8. (In French)

The ratio of L capture to K capture in Ge^{71} was measured by introducing the nuclide in gaseous form in a proportional counter filled with propane. A value $\lambda L/\lambda K = 0.30 \pm 0.02$ was obtained. This result, utilizing the value Rk = 0.45 for the fluorescent yield of Ga, is in disagreement with theoretical predictions. (tr-auth)

2071

ON THE DISINTEGRATION OF Mo^{99}. Christiane Lévi and Lily Papineau. Compt. rend. 239, 1782–4(1954) Dec. 20. (In French)

A β line with a maximum energy of 800 kev has been found in coincidence with the 390-kev γ line already observed in Mo^{99}. The Fermi plot can be obtained from β-γ coincidence spectroscopy. The disintegration scheme was confirmed by γ-γ coincidence measurements. (tr-auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

2072

PARAMAGNETIC RESONANCE ABSORPTION IN PRASEODYMIUM TRICHLORIDE. John H. Anderson and Clyde A. Hutchison, Jr. (Univ. of Chicago, Ill.). Phys. Rev. 97, 76-8 (1955) Jan. 1.

Paramagnetic resonance absorption in crystalline solutions of $PrCl_3$ in $LaCl_3$ has been investigated at a frequency of 2.32×10^{10} sec^{-1} and at the boiling point of He. The apparent g's, when H is parallel and perpendicular to the c axis, have been found to be 1.79 and 3.98, respectively. The results have been discussed in terms of the known crystalline structure and Stark splittings. (auth)

2073

COULOMB EXCITATION OF NEODYMIUM. B. E. Simmons, D. M. Van Patter, K. F. Famularo, and R. V. Stuart (Univ. of Minnesota, Minneapolis). Phys. Rev. 97, 89-92(1955) Jan. 1.

Three gamma rays produced by bombardment of neodymium metal with protons of energies up to 3.34 Mev have been observed. Measurements indicate gamma-ray energies and isotopic identifications of 71±4 kev from Nd^{145}, 300±3 kev from Nd^{148}, and 131±2 kev from Nd^{150}, with total cross sections for production of the last two radiations of 0.7±0.2 and 2.4±0.3 mb, respectively, for 2.25-Mev protons. Excitation functions found for the even-even isotopes agree with those predicted for E2 Coulomb interactions, leading to $0 \rightarrow 2^+ \rightarrow 0$ level assignments; E1 excitation seems ruled out only for Nd^{150}. The theory of Alder and Winther for E2 excitation gives only qualitative agreement with the measured 131-kev gamma-ray angular distribution. Low-energy proton bremsstrahlung were also observed. (auth)

2074

TOWARD A THEORY OF PARAMAGNETIC RESONANCE IN RARE EARTH METALS. S. A. Al'tshuler. Zhur. Eksptl'. i Teoret. Fiz. 26, 439-46(1954) Apr. (In Russian)

2075

PARAMAGNETIC RESONANCE ABSORPTION IN RARE EARTH METALS OF CENTIMETER WAVES. S. G. Salikhov (Physicotechnical Inst., Kazan Affiliation, Academy of Sciences S.S.S.R.). Zhur. Eksptl'. i Teoret Fiz. 26, 447-53 (1954) Apr. (In Russian)

Absorption spectra of Ce, Pr, and Nd at 90 and 290°K at $\lambda = 3.20$ cm are presented, and the effect of temperature is discussed. (G.Y.)

SHIELDING

2076

National Bureau of Standards

THE DOSE RECEIVED BY PARTIALLY SHIELDED GAMMA RAY DETECTORS. Martin J. Berger. Oct. 8, 1954. 26p. (NBS-2902)

Gamma-ray diffusion theory has been applied to the problem of partially shielded detectors. It was assumed that the effect of shielding material could be simulated by endowing the detector with an efficiency that is a function of the direction from which the radiation impinges on it. The validity of the assumption has been tested by comparison of theoretical and experimental values of the dose received by a detector located on the ground and in a hole at depths of 3 and 6 ft. below the ground at various horizontal distances from the source. Agreement was excellent for the detector on the ground. For depths of 3 and 6 ft. the theoretical values were somewhat lower than the experimental values, but agreement was considered to be satisfactory. Closer agreement with experiment probably could have been obtained by accounting for the self- absorption and scattering within the source and for the energy reflected from the walls of the hole. (M.P.G.)

2077

Technical Information Service, AEC

RADIATION SHIELDS AND SHIELDING. A BIBLIOGRAPHY OF UNCLASSIFIED REPORT LITERATURE. Hugh E. Voress, comp. Dec. 1, 1954. 16p. (TID-3032 (suppl.1))

This annotated bibliography contains 53 references to unclassified report literature. Reports available to the Technical Information Service from Sept. 1952 to Oct. 1, 1954, were reviewed. Author, subject, and report number indexes are included. (auth)

SPECTROSCOPY

2078

SPECTROMETRY OF RECOILS FROM NEUTRINO EMISSION IN ARGON-37. Arthur H. Snell and Frances Pleasonton (Oak Ridge National Lab., Tenn.). Phys. Rev. 97, 246-8(1955) Jan. 1.

Magnetic and electric deflection spectrometry apparatus for examining the low-energy recoils of A^{37} resulting from neutrino emission are briefly described. In magnetic deflection, peaks attributable to ions of e/m values 2/37, 3/37, and 4/37 have been observed. They are completely resolved and the charge 2 and 4 peaks are about half as intense as the charge 3 peak. Charge 1 and charge 5 peaks were not observed by this method. The position of the peaks indicate a recoil energy of 10 ± 1 ev. Electric deflection data obtained with a view toward studying the structure of the charge 1 and charge 2 peaks are presented and discussed. (L.M.T.)

2079

THEORY OF THE STARK EFFECT IN A NON-UNIFORM FIELD. CASE OF ATOMS OTHER THAN HYDROGEN. Roger Cayrel. Compt. rend. 239, 1601-3(1954) Dec. 8. (In French)

The perturbation contribution to the energy levels of an atom by the Coulomb field of a neighboring ion is calculated. The perturbation attributed to second order terms in the development of the field is important. It seems to play a large part in the line broadening of hot stars. (tr-auth)

2080

CORRECTION OF CONTINUOUS β SPECTRA FOR THE LIMIT OF RESOLUTION OF THE SPECTROGRAPH. Louis Feuvrais and Tosiko Yusa. Compt. rend. 239, 1627-9(1954) Dec. 8. (In French)

Corrections in continuous β spectra due to the resolving power of a spectrograph are examined for the case of a monoenergetic radiation with Gaussian distribution. For the case of a spectrograph with a thick magnetic lens, and for a resolving power of 3%, a negligible correction is required throughout the entire extent of the spectrum, except at its upper limit. (tr-auth)

2081

THE L SPECTRUM OF PLUTONIUM. Yvette Cauchois, Ioana Manescu, and Françoise Le Berquier. Compt. rend. 239, 1780-2(1954) Dec. 20. (In French)

The first absorption spectrum and x-ray fluorescence spectrum of Pu were observed and measured in a 10-mg sample of PuO_2, produced in the Châtillon pile. (tr-auth)

2082

DIRECT READING SPECTROCHEMICAL ANALYSIS WITH A RAPID-SCANNING SPECTROMETER. Richard K. Brehm

and Velmer A. Fassel (Iowa State Coll., Ames). Spectrochim. Acta 6, 341-72(1954) Dec.

The optical, mechanical, and electronic features of a rapid-scanning spectrometer for direct reading spectrographic analysis are described. In this spectrometer the spectra are rapidly and repeatedly scanned past a single exit-slit, detector assembly, and the individual voltage pulses arising from the particular lines to be measured are electronically isolated, measured, and time integrated. Components of the instrument which are described in detail are as follows: a linear, variable-speed scanning mechanism; circuits for the cathode-ray tube presentation of wavelength versus intensity traces, or actual line spectra; circuits for the electronic isolation of the spectral lines of interest, i.e., master trigger pulse generator and circuits for the delay univibrators, gate univibrators, gate position indicator, and gated amplifiers; the spectral line intensity or pulse-height measuring unit with its associated scaling circuits and pulse counters; and an automatic intensity ratio computer and recorder. Typical analytical results obtained with the present version of the instrument for flame, d-c arc, and spark discharges are described. (auth)

THEORETICAL PHYSICS

2083

ON A THEORY OF INTERACTION OF NUCLEONS AND MESONS. V. P. Silin. Zhur. Eksptl'. i Teoret. Fiz. 24, No. 4, 389-96(1953). (In Russian)

The method of Tamm is used to describe the system of nucleon + one pseudoscalar π meson with pseudoscalar coupling. Nucleon recoil is neglected, and angle variables are separated out. In this approximate treatment the interaction vanishes except in P states. It is shown that the high momentum components of the wave function of this system do not cut off sufficiently rapidly to give a finite energy. (Science Abstracts)

2084

ON THE MAGNETIC MOMENT OF THE NEUTRINO. G. F. Zharkov. Zhur. Eksptl'. i Teoret. Fiz. 24, No. 5, 529-36 (1953). (In Russian)

The magnetic moment arising from the self-energy (which comes from the coupling used in β decay between the neutrino, electron, and nucleon fields) is calculated to lowest order. The expressions are infinite unless the integrands are cut off. This is done at a point which is determined by making the self-mass of the neutrino less than the highest limit set on it by experiment. It is then found that μ_ν/μ_e, the ratio of the neutrino to electron magnetic moment, is $\sim -10^{-14}$. (Science Abstracts)

2085

NEW APPROACH TO THE QUESTION OF THE INFLUENCE OF RELATIVISTIC TERMS IN THE MESON THEORY OF NUCLEAR FORCES. I. I. Verle. Zhur Eksptl'. i Teoret. Fiz. 25, No. 1, 19-35(1953). (In Russian)

The meson field is expanded in terms of its time derivatives as $\phi = \sum_{l=0}^{\infty} \phi^{(2l)}$ where $\phi^{(2l)}$ is the 2lth time derivative of ϕ_0. A system of equations $(\nabla^2-\mu^2)\phi^{(0)} = -\gamma\pi\Omega\delta(x-x_1)$, $(\nabla^2-\mu^2)\phi^{(2)} = \bar{\phi}^{(0)}$) and $(\nabla^2-\mu^2)\phi^{(2l+2)} = \phi^{(2l)}$ is then solved by iteration. Here Ω is the meson-nucleon interaction. The connection between the classical and quantum-mechanical approaches can be made with proper prescriptions, e.g. time derivatives in the above sense are replaced by commutators with the Hamiltonian in quantum mechanics. (Science Abstracts)

2086

ANALYTICAL ONE-ELECTRON WAVE FUNCTIONS IN A MULTI-CONFIGURATIONAL APPROXIMATION FOR ATOMS OF THE TYPE OF HELIUM AND BERYLLIUM. V. I. Kavetskis and A. P. Yutsis. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 257-63(1953). (In Russian)

Configurations are formed from products of one-electron functions, and the parameters are determined by a variational calculation. Results for energies are given for two- and three-configurational approximations. The two-configurational approximations in helium are $1s^2$-$2p^2$, $1s^2$-$2s^2$; for beryllium, $1s^2$-$2s^2$-$1s^2 2p^2$ and $1s^2 2s^2$-$1s^2 3d^2$. The same parameter is used in a given one-electron function in each configuration throughout a given approximate calculation. (Science Abstracts)

2087

SOLUTION OF THE FOCK EQUATIONS FOR THE BERYLLIUM ATOM IN A TWO-CONFIGURATIONAL APPROXIMATION. V. V. Kibartas and A. P. Yutsis. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 264-70(1953). (In Russian)

The configurations $1s^2 2s^2$-$1s^2 2p^2$ are employed to generalize the self-consistent field method. One-electron radial functions are employed which are (a) solutions of the Fock equations (in a one-configurational approximation); (b) solutions in the two-configurational approximation. The results are: "Fock" energy, −14.577; (a) −14.611; (b) −14.622; experiment, −14.666 in atomic units. (Science Abstracts)

2088

INFLUENCE OF NUCLEAR STRUCTURE ON THE PROBABILITY OF K-CAPTURE. L. P. Rapoport. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 282-8(1953). (In Russian)

The changes in the probabilities of first- and second-forbidden transitions are calculated taking into account the finite extent of the nucleus, which is visualized as having a constant charge density with radius R. The ratio w_K/w_{β^+}, where w_K is the probability of K capture and w_{β^+} is the probability of positron emission, is decreased by the finite nuclear extension. (Science Abstracts)

2089

ON THE DISSOCIATION PARAMETER IN PSEUDOSCALAR MESON THEORY WITH PSEUDOSCALAR COUPLING. A. D. Galanin. Zhur. Eksptl'. i Teoret. Fiz. 26, 417-22(1954) Apr. (In Russian)

2090

CERTAIN OBSERVATIONS ON DIVERGENCES IN THE THEORY OF PSEUDOSCALAR MESONS WITH PSEUDOVECTOR COUPLING. A. D. Galanin. Zhur. Eksptl'. i Teoret. Fiz. 26, 423-9(1954) Apr. (In Russian)

2091

FREELY MOVING NUCLEONS. S. I. Pekar (Institute of Physics, Academy of Science, Ukrainian S.S.R.). Zhur. Eksptl'. i Teoret. Fiz. 27, 411-20(1954) Oct. (In Russian)

The theory of strong coupling of nucleons with the fields of charged and neutral mesons is extended to calculation of the energy spectrum and wave function of freely moving nucleons. Interactions between longitudinal and rotary motions of the nucleon are treated. (G.Y.)

2092

RENORMALIZATION OF MASS AND CHARGE IN CO-

VARIANT EQUATIONS OF QUANTUM FIELD THEORY. A. D. Galanin, B. L. Ioffe, and I. Ya. Pomeranchuk. Doklady Akad. Nauk S.S.S.R. 98, 361–4(1954) Sept. 21. (In Russian)

2093

CAUSAL OPERATORS IN QUANTUM FIELD THEORY. Yu. V. Novozhilov (Leningrad State Univ.). Doklady Akad. Nauk S.S.S.R. 99, 533–6(1954) Dec. 1. (In Russian)

2094

ON QUANTUM FIELD THEORY WITH CAUSAL OPERATORS. Yu. V. Novozhilov (Leningrad State Univ.). Doklady Akad. Nauk S.S.S.R. 99, 723–6(1954) Dec. 11. (In Russian)

2095

NUMERICAL CALCULATION OF (d,p) ANGULAR DISTRIBUTIONS. W. Tobocman and W. H. Kalos (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 97, 132–6(1955) Jan. 1.

The (d,p) cross section has been calculated by taking into account the Coulomb interaction, the interaction of the liberated protons with the residual nucleus, and the scattering of the incident deuteron beam. These effects were found to be important in all the cases considered. (auth)

2096

APPROXIMATE ANALYTIC SOLUTION OF THE THOMAS-FERMI EQUATION FOR ATOMS. T. Tietz (Univ. Nicolas Copernicus, Torum, Poland). J. Chem. Phys. 22, 2094–5 (1954) Dec.

TRITIUM AND TRITIUM COMPOUNDS

2097

MICROWAVE SPECTRA OF TRITIUM IODIDE AND TRITIUM BROMIDE. B. Rosenblum and A. H. Nethercot, Jr. (Columbia Univ., New York). Phys. Rev. 97, 84–5 (1955) Jan. 1.

The J = 1←0 rotational transitions in TI and TBr have been observed. A tritium–deuterium mass ratio has been determined, and electronic effects which cause errors in this ratio considered. (auth)

URANIUM AND URANIUM COMPOUNDS

2098

Naval Research Lab.

A NOTE ON THE EFFECT OF SMALL STRAINS ON THE ELECTRICAL RESISTANCE OF URANIUM WIRE. E. W. Kammer. Oct. 15, 1953. Decl. Jan. 19, 1954. 7p. Contract AT(30-1)-1344. (NYO-3791; NRL-4266)

An experiment which permits estimation of the strain effects upon resistivity for polycrystalline U wire is described, and results are plotted. The apparatus for measuring the effect of strain upon resistivity is shown. (J.A.G.)

2043

PASSAGE OF CHARGED PARTICLES THROUGH MAGNETIC MATERIALS. A. G. Sitenko. Doklady Akad. Nauk S.S.S.R. 98, 377-80(1954) Sept. 21. (In Russian)

Equations are derived for the effect of magnetic material on the emission of Cherenkov radiation by charged particles traversing it. (G.Y.)

2044

KINEMATICAL INVESTIGATIONS OF MESON-NUCLEAR REACTIONS. Satio Hayakawa, Masaaki Kawaguchi, and Shigeo Minami (Kyoto Univ. and Osaka Univ., Japan). Progr. Theoret. Phys. (Japan) 12, 355-62(1954) Sept.

The angular distribution and the polarization of recoil nucleons for meson-nucleon scattering as well as photomeson production are studied from the kinematical point of view. Similar to the case of meson-nucleon scattering, there exists a simple symmetry property also in the photomeson production. The angular distribution is invariant under the simultaneous interchange of the reaction amplitudes of electric and magnetic radiations with the same multipole order and the same total angular momentum. This interchange upsets the sense of the polarization of recoil nucleons. For practical purposes the tables of the angular distribution and the polarization are given for J's up to $\frac{3}{2}$. (auth)

2045

A CAVITY IONIZATION THEORY INCLUDING THE EFFECTS OF ENERGETIC SECONDARY ELECTRONS. L. V. Spencer and Frank H. Attix (National Bureau of Standards, Washington, D. C.). Radiology 64, 113(1955) Jan.

The energy dissipated per unit mass in air was calculated relative to wall materials of C, Al, Cu, Sn, and Pb irradiated by Co^{60} γ radiation. The role of secondary electrons is discussed, and modifications are proposed in the Bragg-Gray theory of cavity ionization. (C.H.)

2046

BROAD BEAM ATTENUATION OF 70-250 KV.P. X-RAY BEAMS IN ALUMINUM. E. Dale Trout, John P. Kelley, Arthur C. Lucas, and Edward J. Furno. Radiology 64, 114 (1955) Jan.

The attenuation of x radiation produced by pulsating voltages of 70, 100, 125, 150, 200, and 250 kvp was measured in commercially pure Al, and results are applied to computations of the thickness of concrete needed for shielding. (C.H.)

2047

DOSE TO WALLS IN RADIOGRAPHIC ROOMS. Scott W. Smith and Robert J. Kennedy (National Bureau of Standards, Washington, D. C.). Radiology 64, 114-15(1955) Jan.

Preliminary results are presented from a survey of the radiation actually reaching the walls in radiographic rooms in a number of installations. Requirements for protective materials for radiographic rooms are discussed briefly. (C.H.)

2048

INTERFERENCE EFFECTS IN THE TOTAL NEUTRON SCATTERING CROSS-SECTION OF CRYSTALS. G. Placzek and L. Van Hove (Institute for Advanced Study, Princeton, N. J.). Nuovo cimento (10) 1, 233-56(1955) Jan. (In English)

A general discussion is given for the interference effects in the total neutron scattering cross section of crystals. The limiting cases of short and long wavelengths are examined in detail. The inadequacy of the Debye approximation for quantitative calculation of the long wavelength interference term is emphasized. (auth)

2049

HIGH ENERGY ELECTRON SCATTERING BY POLARIZED NUCLEI. S. Ferroni and S. Fubini (Univ. of Torin, Italy). Nuovo cimento (10) 1, 263-5(1955) Jan. (In English)

A theoretical solution of the elastic scattering problem for high-energy electrons by polarized nuclei is attempted without explicitly solving the Dirac equation for assymetric charge distribution. An expression for the angular distribution effect is derived, and this is used to calculate the azimuthal effect for Ta^{181}. An effect of the order of 40% is obtained, using the Born approximation. The numerical result is not considered reliable because of the inadequacy of the Born approximation for problems of this type. (K.S.)

RADIATION EFFECTS

2050

Phillips Petroleum Co. Atomic Energy Div.

GAMMA-RAY DOSAGE RATE MEASUREMENT. C[alvin] H. Hogg. Nov. 22, 1954. 17p. Contract AT(10-1)-205. (IDO-16205)

The methods of measuring gamma-ray dosage in the gamma facility at the MTR site are described in this report. Data from three types of detectors—an aluminum calorimeter, an ion chamber, and a ceric sulfate dosimeter—are presented. It is shown that the three detectors give essentially the same value of dosage. (auth)

2051

Bausch and Lomb Optical Co.

IRRADIATION DAMAGE TO GLASS. Norbert J. Kreidl and J. Raymond Hensler. Nov. 1, 1954. 99p. Contract AT(30-1)-1312. (NYO-3780)

Silicate and phosphate glasses exposed to gamma radiation develop a visible absorption similar to the F-band developed in alkali halide crystals. In optical glasses this decrease in transmission prevents their use under exposure conditions. Cerium in the glass prevents this coloration. Five conventional optical glasses containing cerium were developed, maintaining the optical constants, high quality, and good color while "protecting" them against exposure to 10^6 roentgens. Effects of other elements on radiation damage are reported. Optics and instruments utilizing these glasses were developed and tested, particularly a stereo relay system, a remote viewing microscope. (J.E.D.)

2052

CHANGE OF SURFACE PROPERTY BY α RADIATION. Cestmir Jech. Z. physik. Chem. (Leipzig) 203, 309-11(1954) Oct. (In German)

2053

APPLICATIONS OF HIGH-ENERGY ELECTRONS TO THE STERILIZATION OF PHARMACEUTICALS AND THE IRRADIATION OF PLASTICS. C. W. Miller (Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, England.). J. Brit. Inst. Radio Engrs. 14, 637-52(1954) Dec.

The sterilization of pharmaceutical products and the variation of the physical properties of certain plastics by the action of ionizing radiations is described. It is shown that most efficient use of the available energy is made if electron bombardment is used in preference to x or gamma radiation. It is also shown that for the present time high-energy

electrons are best obtained from some form of accelerator rather than from radioactive sources. In particular the linear accelerator forms a very convenient source. Experiments using a linear accelerator are described and the economics of the process shown to be attractive. (auth)

RADIOACTIVITY

2054

Mound Lab.

A SIMPLIFIED PROCEDURE FOR COMPUTING THE GROWTH OF RADIOACTIVE DECAY PRODUCTS. H. W. Kirby and D. A. Kremer. May 10, 1954. 19p. Contract AT-33-1-GEN-53. (MLM-970)

A method for calculating the growth of radioactive decay products is described which reduces the labor of computation. This method is valuable when the decay chain is long, as in the radium, thorium, actinium, and neptunium series. By a suitable rearrangement, Bateman coefficients are expressed in a modified form so that these coefficients may be evaluated by means of tables. Examples showing use of the tables are given. (auth)

2055

LONG-LIVED ISOMER OF Np^{236}. M. H. Studier, J. E. Gindler, and C. M. Stevens (Argonne National Lab., Lemont, Ill.). Phys. Rev. 97, 88(1955) Jan. 1.

A long-lived isomer of Np^{236}, identified by chemical and mass spectrometric means, has been prepared by the U^{238} (d,4n) reaction. The alpha half life of this isomer has not been established but a lower limit of 5000 years has been placed on the beta half life. The cross section for the U^{238} (d,4n)$Np^{236,236*}$ reaction for 21.6-Mev deuterons has been calculated to be approximately 35 millibarns. A slow neutron fission cross section of 2800 barns has been determined for the long-lived isomer. (auth)

2056

RADIOACTIVITY OF In^{117} AND Sb^{117}. Carl L. McGinnis (National Bureau of Standards and National Research Council, Washington, D. C.). Phys. Rev. 97, 93-7(1955) Jan. 1.

The $p_{1/2}$ isomeric level of In^{117} decays with a 1.9-hr half life 49 % by a 1.777-Mev β^- to the $S_{1/2}$ ground state of Sn^{117}, 23 % by a 1.616-Mev β^- to the 0.161-Mev $d_{3/2}$ level of Sn^{117}, and 28 % by an M4 0.311-Mev γ to the $g_{9/2}$ ground state of In^{117}. The latter decays with a 1.1-hr half life by a 0.740-Mev β^- to the $g_{7/2}$ level of Sn^{117} which is de-excited by a 0.565-Mev γ and a 0.161-Mev γ in cascade. There is no crossover γ (<1 %). Less than 10 % of the 3.0-hr Cd^{117} decays to the 1.9-hr level. Less than 1% of the 1.1-hr ground state populates the 14-day Sn^{117m}. The 2.8-hr Sb^{117} decays to the 0.161-Mev level of Sn^{117} by a 0.61-Mev $\beta^+(\beta^+/\epsilon = 0.026)$ but does not decay to the 0.323- or 0.726-Mev levels (<0.5%). (auth)

2057

DECAY SCHEME OF THE MIRROR NUCLEUS P^{29} AND RELATED RESULTS. H. Roderick, O. Lonsjo, and W. E. Meyerhof (Stanford Univ., Calif.). Phys. Rev. 97, 97-101 (1955) Jan. 1.

The decay of P^{29} has been investigated with scintillation spectrometers, single and in coincidence. Positron emission (3.945±0.05 Mev end-point energy for the most energetic spectrum) occurs with a half life of 4.45±0.05 sec to the ground state and to excited levels of Si^{29} at 1.28, 2.43, and possibly 2.03 Mev. Branching ratios (in percent) of 98.8± 0.4 (ground state), 0.8±0.2 (1.28-Mev level), <0.15 (2.03-Mev level), and $0.24-_{0.08}^{+0.26}$ (2.43-Mev level) were measured. A study of γ rays from the decay of Al^{29} to Si^{29} led to branching ratios (in percent) of 15±9 (1.28-Mev level), <4 (2.03-Mev level), and 85±9 (2.43-Mev level). The intensity of a 1.15-Mev γ ray (cascading from the 2.43-Mev level) has been set at <11% of the total Al^{29} decays. Spin and parity assignments of the Si^{29} levels are discussed and compared with the results of other experiments. The ft values of the P^{29} decay are shown to agree with values calculated from the coupling constants of β decay if the theories of Feenberg and Bohr are used. (auth)

2058

ENERGY LEVELS OF Hf^{177}. P. Marmier and F. Boehm (California Inst. of Tech., Pasadena). Phys. Rev. 97, 103-4 (1955) Jan. 1.

The nuclear spectrum of Lu^{177} has been investigated. Three excited levels of Hf^{177} have energies of 112.97, 249.69, and 321.33 kev. A decay scheme is proposed. (auth)

2059

ELECTRON-NEUTRINO ANGULAR CORRELATION IN THE BETA DECAY OF NEON^{19}. D. R. Maxson, J. S. Allen, and W. K. Jentschke (Univ. of Illinois, Urbana). Phys. Rev. 97, 109-16(1955) Jan. 1.

The electron-neutrino angular correlation in the beta decay of Ne^{19} has been measured by observing the energy spectrum of F^{19} recoil ions. The constant λ in the angular correlation function $[1+\lambda(v_e/c)\cos\theta_{ev}]$ was found to be $\lambda = -0.21\pm0.08$, indicating that the beta-decay interaction is of the form STP and not VTP. The observed angular correlation leads to the result

$$C_S^2|\int 1|^2 / C_T^2|\int\sigma|^2 = 0.69 \pm 0.17,$$

which is consistent with $C_S^2 \simeq C_T^2$ if the nuclear configuration is $(d_{5/2})^3_{1/2}$, but not if the configuration is $(s_{1/2})^3_{1/2}$. Most of the F^{19} recoils carried one unit of negative charge, but singly charged positive ions were also detected. The coincidence rate due to positive ions was about 10% of that due to negative ions. No doubly charged recoils were observed. (auth)

2060

STUDIES ON THE ISOMERIC PAIR, Nb^{89m} AND Nb^{89}. Hirdaya B. Mathur, Earl K. Hyde, Charles A. Levine, and Per K. Kofstad (Univ. of California, Berkeley). Phys. Rev. 97, 117-20(1955) Jan. 1.

By bombardment of zirconium, niobium, yttrium, and silver targets in the 184-inch cyclotron it has been possible to produce the isomer pair Nb^{89m} and Nb^{89}. The isomerism arises from the odd 41st proton below the 50-proton closed shell of the single-particle nuclear model. Nb^{89} ($g_{9/2}$) is a 1.9-hour activity emitting 2.85-Mev positrons to produce Zr^{89}. The yeild of the Nb^{89m} ($p_{1/2}$) is about 30–100 fold less and its radiations were not directly observed. By scintillation spectrometer measurements on zirconium daughter activity it is shown that Nb^{89m} decays with about a 2-hour half life to 4.4-minute Zr^{89m} ($p_{1/2}$). The M4 gamma transtion between the two niobium levels is not observed, indicating that the level spacing is small and the upper level deactivates primarily by positron emission. The log ft values are larger than expected and are discussed in terms of the even-even core rearrangement considerations of A. De-Shalit and M. Goldhaber [Phys. Rev. 92, 1211(1953)]. Nb^{89} was also prepared by bombardment of NaBr with accelerated carbon ions in the 60-inch cyclotron. (auth)

2061

DECAY OF V^{49}. W. S. Lyon (Oak Ridge National Lab., Tenn.). Phys. Rev. 97, 121(1955) Jan. 1.

V^{49}, produced by proton bombardment of Cr, has been found to be a pure K-capture nuclide with $< 0.05\%$ β^+ branching or γ radiation; the half life is 334 ± 20 days. (auth)

2062

SUMMING STUDIES OF THE GAMMA RAYS FOLLOWING THE DECAYS OF Ba^{131}, Se^{75}, AND Ru^{106}. D. C. Lu, W. H. Kelly, and M. L. Wiedenbeck (Univ. of Michigan, Ann Arbor). Phys. Rev. 97, 139-42(1955) Jan. 1.

Coincidences between the gamma rays following the decays in Ba^{131}, Se^{75}, and Ru^{106} have been examined with the summing technique. The experimental evidences lead to a new decay scheme for Ba^{131}. Some discrepancies with previous investigations are found in Se^{75}, which leads to a revision of the decay scheme. (auth)

2063

GAMMA AND X-RADIATION IN THE DECAY OF Am^{241}. H. Jaffe, T. O. Passell, C. I. Browne, and I. Perlman (Univ. of California, Berkeley). Phys. Rev. 97, 142-50(1955) Jan. 1.

The decay scheme of Am^{241} is discussed in terms of new information on the conversion electrons, gamma rays, and L series x rays accompanying its alpha decay. The photons were measured with a scintillation spectrometer and a bent crystal spectrometer and the conversion electron spectrum was determined with a double focusing beta-ray spectrometer. (auth)

2064

ISOMERISM IN Al^{26}. R. W. Kavanagh, W. R. Mills, and R. Sherr (California Inst. of Tech., Pasadena). Phys. Rev. 97, 248-50(1955) Jan. 1.

It has been observed that the ratio of γ-ray to positron yield in the Mg^{25} (p,γ) reaction varies with bombarding energy (Kluyver et al. Phys. Rev. 94, 1795(1954)). This note describes experiments which confirmed this observation and which, by a new measurement of β-decay energy and γ spectra, established the location of the 6.7-sec state in Al^{26}. (L.M.T.)

2065

ANALYZING BETA ABSORPTION GRAPHICALLY TO IDENTIFY EMITTERS. John H. Harley and Naomi Hallden (New York Operations Office, A.E.C.). Nucleonics 13, No. 1, 32-5(1955) Jan.

A new method is described for determining the maximum β-ray energy of a sample isotope from absorption measurements. The logarithm of the transmission of the sample and a standard are plotted against each other for each absorber used. The slope of the resulting straight line is characteristic of the maximum β-ray energy of the sample. The curve can be uniquely determined with very few absorbers. The β energies of samples containing more than one isotope can be determined if the energies are appreciably different. The logarithmic plot of 2 samples of the same isotope or of 2 samples in which isotopes are present in the same proportion will have a unit slope. This makes the method valuable for determining impurities in radiochemical precipitates. (M.P.G.)

2066

RADON RELEASED FROM CONCRETE IN RADIANT HEATING. A. F. Gabrysh and F. J. Davis (Oak Ridge National Lab., Tenn.). Nucleonics 13, No. 1, 50(1955) Jan.

It has been determined that concrete made from shale containing U will leak Rn by gas diffusion through microfissures, especially when the concrete is warmed. In an 8 ft high room with a heated concrete floor 15 ft × 10 ft × 3 in. made from shale containing 0.008% U, it was calculated from experimental data that the air would contain 1.5×10^{-11} c of Rn per liter. Building materials having an average U concentraction of 0.004% and higher should be avoided in structures for human habitation. (M.P.G.)

2067

THE LITTLE HOTSPOT. MINIATURE Co^{60} GAMMA IRRADIATOR. W. S. Eastwood (Atomic Energy Research Establishment, Harwell, Berks, England). Nucleonics 13, No. 1, 52-3(1955) Jan.

A cylindrical γ source has been designed capable of providing dose rates greater than 10^6 rep/hr for specimens no larger than 13 mm in diameter. Radiation is reasonably uniform over an axial length of 2 cm. The source is composed of 8 cylinders containing Co^{60}. The cylinders are arranged in a ring within a lead-filled container having 8 in. wall thickness. The total activity of the source is 439 c. Doses outside the chamber are very small. The unit is compact, and the container could be made by an university workshop. (M.P.G.)

2068

SURVEY OF THE Zr^{95} + Nb^{95} RADIATIONS. P. P. Zarubin. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 563-79(1954) Sept.-Oct. (In Russian)

The literature on the $Zr^{95} \rightarrow Nb^{95} \rightarrow Mo^{95}$ decay is reviewed in detail, the available data are compiled, and proposed decay schemes are compared. 38 references. (G.Y.)

2069

SURVEY OF THE Rb^{86} RADIATIONS. A. G. Dmitriev and P. P. Zarubin. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 580-8(1954) Sept.-Oct. (In Russian)

The literature on the β and γ spectra and decay schemes of Rb^{86} is reviewed. 24 references. (G.Y.)

2070

PROPORTIONAL COUNTER MEASUREMENT OF THE L CAPTURE/K CAPTURE RATIO OF Ge^{71}. Michel Langevin. Compt. rend. 239, 1625-7(1954) Dec. 8. (In French)

The ratio of L capture to K capture in Ge^{71} was measured by introducing the nuclide in gaseous form in a proportional counter filled with propane. A value $\lambda L/\lambda K = 0.30 \pm 0.02$ was obtained. This result, utilizing the value $Rk = 0.45$ for the fluorescent yield of Ga, is in disagreement with theoretical predictions. (tr-auth)

2071

ON THE DISINTEGRATION OF Mo^{99}. Christiane Lévi and Lily Papineau. Compt. rend. 239, 1782-4(1954) Dec. 20. (In French)

A β line with a maximum energy of 800 kev has been found in coincidence with the 390-kev γ line already observed in Mo^{99}. The Fermi plot can be obtained from β-γ coincidence spectroscopy. The disintegration scheme was confirmed by γ-γ coincidence measurements. (tr-auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

2072

PARAMAGNETIC RESONANCE ABSORPTION IN PRASEODYMIUM TRICHLORIDE. John H. Anderson and Clyde A. Hutchison, Jr. (Univ. of Chicago, Ill.). Phys. Rev. 97, 76-8 (1955) Jan. 1.

Paramagnetic resonance absorption in crystalline solutions of $PrCl_3$ in $LaCl_3$ has been investigated at a frequency of 2.32×10^{10} sec^{-1} and at the boiling point of He. The apparent g's, when H is parallel and perpendicular to the c axis, have been found to be 1.79 and 3.98, respectively. The results have been discussed in terms of the known crystalline structure and Stark splittings. (auth)

2073

COULOMB EXCITATION OF NEODYMIUM. B. E. Simmons, D. M. Van Patter, K. F. Famularo, and R. V. Stuart (Univ. of Minnesota, Minneapolis). Phys. Rev. 97, 89-92(1955) Jan. 1.

Three gamma rays produced by bombardment of neodymium metal with protons of energies up to 3.34 Mev have been observed. Measurements indicate gamma-ray energies and isotopic identifications of 71±4 kev from Nd^{145}, 300±3 kev from Nd^{148}, and 131±2 kev from Nd^{150}, with total cross sections for production of the last two radiations of 0.7±0.2 and 2.4±0.3 mb, respectively, for 2.25-Mev protons. Excitation functions found for the even-even isotopes agree with those predicted for E2 Coulomb interactions, leading to $0 \rightarrow 2^+ \rightarrow 0$ level assignments; E1 excitation seems ruled out only for Nd^{150}. The theory of Alder and Winther for E2 excitation gives only qualitative agreement with the measured 131-kev gamma-ray angular distribution. Low-energy proton bremsstrahlung were also observed. (auth)

2074

TOWARD A THEORY OF PARAMAGNETIC RESONANCE IN RARE EARTH METALS. S. A. Al'tshuler. Zhur. Eksptl'. i Teoret. Fiz. 26, 439-46(1954) Apr. (In Russian)

2075

PARAMAGNETIC RESONANCE ABSORPTION IN RARE EARTH METALS OF CENTIMETER WAVES. S. G. Salikhov (Physicotechnical Inst., Kazan Affiliation, Academy of Sciences S.S.S.R.). Zhur. Eksptl'. i Teoret Fiz. 26, 447-53 (1954) Apr. (In Russian)

Absorption spectra of Ce, Pr, and Nd at 90 and 290°K at $\lambda = 3.20$ cm are presented, and the effect of temperature is discussed. (G.Y.)

SHIELDING

2076

National Bureau of Standards

THE DOSE RECEIVED BY PARTIALLY SHIELDED GAMMA RAY DETECTORS. Martin J. Berger. Oct. 8, 1954. 26p. (NBS-2902)

Gamma-ray diffusion theory has been applied to the problem of partially shielded detectors. It was assumed that the effect of shielding material could be simulated by endowing the detector with an efficiency that is a function of the direction from which the radiation impinges on it. The validity of the assumption has been tested by comparison of theoretical and experimental values of the dose received by a detector located on the ground and in a hole at depths of 3 and 6 ft. below the ground at various horizontal distances from the source. Agreement was excellent for the detector on the ground. For depths of 3 and 6 ft. the theoretical values were somewhat lower than the experimental values, but agreement was considered to be satisfactory. Closer agreement with experiment probably could have been obtained by accounting for the self- absorption and scattering within the source and for the energy reflected from the walls of the hole. (M.P.G.)

2077

Technical Information Service, AEC

RADIATION SHIELDS AND SHIELDING. A BIBLIOGRAPHY OF UNCLASSIFIED REPORT LITERATURE. Hugh E. Voress, comp. Dec. 1, 1954. 16p. (TID-3032 (suppl. 1))

This annotated bibliography contains 53 references to unclassified report literature. Reports available to the Technical Information Service from Sept. 1952 to Oct. 1, 1954, were reviewed. Author, subject, and report number indexes are included. (auth)

SPECTROSCOPY

2078

SPECTROMETRY OF RECOILS FROM NEUTRINO EMISSION IN ARGON-37. Arthur H. Snell and Frances Pleasonton (Oak Ridge National Lab., Tenn.). Phys. Rev. 97, 246-8(1955) Jan. 1.

Magnetic and electric deflection spectrometry apparatus for examining the low-energy recoils of A^{37} resulting from neutrino emission are briefly described. In magnetic deflection, peaks attributable to ions of e/m values 2/37, 3/37, and 4/37 have been observed. They are completely resolved and the charge 2 and 4 peaks are about half as intense as the charge 3 peak. Charge 1 and charge 5 peaks were not observed by this method. The position of the peaks indicate a recoil energy of 10 ± 1 ev. Electric deflection data obtained with a view toward studying the structure of the charge 1 and charge 2 peaks are presented and discussed. (L.M.T.)

2079

THEORY OF THE STARK EFFECT IN A NON-UNIFORM FIELD. CASE OF ATOMS OTHER THAN HYDROGEN. Roger Cayrel. Compt. rend. 239, 1601-3(1954) Dec. 8. (In French)

The perturbation contribution to the energy levels of an atom by the Coulomb field of a neighboring ion is calculated. The perturbation attributed to second order terms in the development of the field is important. It seems to play a large part in the line broadening of hot stars. (tr-auth)

2080

CORRECTION OF CONTINUOUS β SPECTRA FOR THE LIMIT OF RESOLUTION OF THE SPECTROGRAPH. Louis Feuvrais and Tosiko Yuasa. Compt. rend. 239, 1627-9(1954) Dec. 8. (In French)

Corrections in continuous β spectra due to the resolving power of a spectrograph are examined for the case of a monoenergetic radiation with Gaussian distribution. For the case of a spectrograph with a thick magnetic lens, and for a resolving power of 3%, a negligible correction is required throughout the entire extent of the spectrum, except at its upper limit. (tr-auth)

2081

THE L SPECTRUM OF PLUTONIUM. Yvette Cauchois, Ioana Manescu, and Françoise Le Berquier. Compt. rend. 239, 1780-2(1954) Dec. 20. (In French)

The first absorption spectrum and x-ray fluorescence spectrum of Pu were observed and measured in a 10-mg sample of PuO_2, produced in the Châtillon pile. (tr-auth)

2082

DIRECT READING SPECTROCHEMICAL ANALYSIS WITH A RAPID-SCANNING SPECTROMETER. Richard K. Brehm

and Velmer A. Fassel (Iowa State Coll., Ames). Spectrochim. Acta 6, 341-72(1954) Dec.

The optical, mechanical, and electronic features of a rapid-scanning spectrometer for direct reading spectrographic analysis are described. In this spectrometer the spectra are rapidly and repeatedly scanned past a single exit-slit, detector assembly, and the individual voltage pulses arising from the particular lines to be measured are electronically isolated, measured, and time integrated. Components of the instrument which are described in detail are as follows: a linear, variable-speed scanning mechanism; circuits for the cathode-ray tube presentation of wavelength versus intensity traces, or actual line spectra; circuits for the electronic isolation of the spectral lines of interest, i.e., master trigger pulse generator and circuits for the delay univibrators, gate univibrators, gate position indicator, and gated amplifiers; the spectral line intensity or pulse-height measuring unit with its associated scaling circuits and pulse counters; and an automatic intensity ratio computer and recorder. Typical analytical results obtained with the present version of the instrument for flame, d-c arc, and spark discharges are described. (auth)

THEORETICAL PHYSICS

2083

ON A THEORY OF INTERACTION OF NUCLEONS AND MESONS. V. P. Silin. Zhur. Eksptl'. i Teoret. Fiz. 24, No. 4, 389-96(1953). (In Russian)

The method of Tamm is used to describe the system of nucleon + one pseudoscalar π meson with pseudoscalar coupling. Nucleon recoil is neglected, and angle variables are separated out. In this approximate treatment the interaction vanishes except in P states. It is shown that the high momentum components of the wave function of this system do not cut off sufficiently rapidly to give a finite energy. (Science Abstracts)

2084

ON THE MAGNETIC MOMENT OF THE NEUTRINO. G. F. Zharkov. Zhur. Eksptl'. i Teoret. Fiz. 24, No. 5, 529-36 (1953). (In Russian)

The magnetic moment arising from the self-energy (which comes from the coupling used in β decay between the neutrino, electron, and nucleon fields) is calculated to lowest order. The expressions are infinite unless the integrands are cut off. This is done at a point which is determined by making the self-mass of the neutrino less than the highest limit set on it by experiment. It is then found that μ_ν/μ_e, the ratio of the neutrino to electron magnetic moment, is $\sim -10^{-14}$. (Science Abstracts)

2085

NEW APPROACH TO THE QUESTION OF THE INFLUENCE OF RELATIVISTIC TERMS IN THE MESON THEORY OF NUCLEAR FORCES. I. I. Verle. Zhur Eksptl'. i Teoret. Fiz. 25, No. 1, 19-35(1953). (In Russian)

The meson field is expanded in terms of its time derivatives as $\phi = \sum_{l=0}^{\infty} \phi^{(2l)}$ where $\phi^{(2l)}$ is the 2lth time derivative of ϕ_0. A system of equations $(\nabla^2-\mu^2)\phi^{(0)} = -\gamma\pi\Omega\delta(x-x_1)$, $(\nabla^2-\mu^2)\phi^{(2)} = \ddot{\phi}^{(0)}$) and $(\nabla^2-\mu^2)\bar{\phi}^{(2l+2)} = \ddot{\phi}^{(2l)}$ is then solved by iteration. Here Ω is the meson-nucleon interaction. The connection between the classical and quantum-mechanical approaches can be made with proper prescriptions, e.g. time derivatives in the above sense are replaced by commutators with the Hamiltonian in quantum mechanics. (Science Abstracts)

2086

ANALYTICAL ONE-ELECTRON WAVE FUNCTIONS IN A MULTI-CONFIGURATIONAL APPROXIMATION FOR ATOMS OF THE TYPE OF HELIUM AND BERYLLIUM. V. I. Kavetskis and A. P. Yutsis. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 257-63(1953). (In Russian)

Configurations are formed from products of one-electron functions, and the parameters are determined by a variational calculation. Results for energies are given for two- and three-configurational approximations. The two-configurational approximations in helium are $1s^2$-$2p^2$, $1s^2$-$2s^2$; for beryllium, $1s^2$-$2s^2$-$1s^22p^2$ and $1s^22s^2$-$1s^23d^2$. The same parameter is used in a given one-electron function in each configuration throughout a given approximate calculation. (Science Abstracts)

2087

SOLUTION OF THE FOCK EQUATIONS FOR THE BERYLLIUM ATOM IN A TWO-CONFIGURATIONAL APPROXIMATION. V. V. Kibartas and A. P. Yutsis. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 264-70(1953). (In Russian)

The configurations $1s^22s^2$-$1s^22p^2$ are employed to generalize the self-consistent field method. One-electron radial functions are employed which are (a) solutions of the Fock equations (in a one-configurational approximation); (b) solutions in the two-configurational approximation. The results are: "Fock" energy, −14.577; (a) −14.611; (b) −14.622; experiment, −14.666 in atomic units. (Science Abstracts)

2088

INFLUENCE OF NUCLEAR STRUCTURE ON THE PROBABILITY OF K-CAPTURE. L. P. Rapoport. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 3, 282-8(1953). (In Russian)

The changes in the probabilities of first- and second-forbidden transitions are calculated taking into account the finite extent of the nucleus, which is visualized as having a constant charge density with radius R. The ratio w_K/w_{β^+}, where w_K is the probability of K capture and w_{β^+} is the probability of positron emission, is decreased by the finite nuclear extension. (Science Abstracts)

2089

ON THE DISSOCIATION PARAMETER IN PSEUDOSCALAR MESON THEORY WITH PSEUDOSCALAR COUPLING. A. D. Galanin. Zhur. Eksptl'. i Teoret. Fiz. 26, 417-22(1954) Apr. (In Russian)

2090

CERTAIN OBSERVATIONS ON DIVERGENCES IN THE THEORY OF PSEUDOSCALAR MESONS WITH PSEUDOVECTOR COUPLING. A. D. Galanin. Zhur. Eksptl'. i Teoret. Fiz. 26, 423-9(1954) Apr. (In Russian)

2091

FREELY MOVING NUCLEONS. S. I. Pekar (Institute of Physics, Academy of Science, Ukrainian S.S.R.). Zhur. Eksptl'. i Teoret. Fiz. 27, 411-20(1954) Oct. (In Russian)

The theory of strong coupling of nucleons with the fields of charged and neutral mesons is extended to calculation of the energy spectrum and wave function of freely moving nucleons. Interactions between longitudinal and rotary motions of the nucleon are treated. (G.Y.)

2092

RENORMALIZATION OF MASS AND CHARGE IN CO-

VARIANT EQUATIONS OF QUANTUM FIELD THEORY. A. D. Galanin, B. L. Ioffe, and I. Ya. Pomeranchuk. Doklady Akad. Nauk S.S.S.R. 98, 361-4(1954) Sept. 21. (In Russian)

2093

CAUSAL OPERATORS IN QUANTUM FIELD THEORY. Yu. V. Novozhilov (Leningrad State Univ.). Doklady Akad. Nauk S.S.S.R. 99, 533-6(1954) Dec. 1. (In Russian)

2094

ON QUANTUM FIELD THEORY WITH CAUSAL OPERATORS. Yu. V. Novozhilov (Leningrad State Univ.). Doklady Akad. Nauk S.S.S.R. 99, 723-6(1954) Dec. 11. (In Russian)

2095

NUMERICAL CALCULATION OF (d,p) ANGULAR DISTRIBUTIONS. W. Tobocman and W. H. Kalos (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 97, 132-6(1955) Jan. 1.

The (d,p) cross section has been calculated by taking into account the Coulomb interaction, the interaction of the liberated protons with the residual nucleus, and the scattering of the incident deuteron beam. These effects were found to be important in all the cases considered. (auth)

2096

APPROXIMATE ANALYTIC SOLUTION OF THE THOMAS-FERMI EQUATION FOR ATOMS. T. Tietz (Univ. Nicolas Copernicus, Torum, Poland). J. Chem. Phys. 22, 2094-5 (1954) Dec.

TRITIUM AND TRITIUM COMPOUNDS

2097

MICROWAVE SPECTRA OF TRITIUM IODIDE AND TRITIUM BROMIDE. B. Rosenblum and A. H. Nethercot, Jr. (Columbia Univ., New York). Phys. Rev. 97, 84-5 (1955) Jan. 1.

The J = 1←0 rotational transitions in TI and TBr have been observed. A tritium–deuterium mass ratio has been determined, and electronic effects which cause errors in this ratio considered. (auth)

URANIUM AND URANIUM COMPOUNDS

2098

Naval Research Lab.

A NOTE ON THE EFFECT OF SMALL STRAINS ON THE ELECTRICAL RESISTANCE OF URANIUM WIRE. E. W. Kammer. Oct. 15, 1953. Decl. Jan. 19, 1954. 7p. Contract AT(30-1)-1344. (NYO-3791; NRL-4266)

An experiment which permits estimation of the strain effects upon resistivity for polycrystalline U wire is described, and results are plotted. The apparatus for measuring the effect of strain upon resistivity is shown. (J.A.G.)

NUCLEAR SCIENCE ABSTRACTS

Volume 9 March 31, 1955 No. 6A

AUTHOR INDEX

For each reference the digit preceding the dash is the volume number and digits after the dash are the abstract number.

ADAMS D C
9-1847
ADAMS D S
9-1838
AGLINTSEV K K
9-1972
AGREST M M
9-1967
AHAMOVSKII L M
9-1933
ALEXANDER G E
9-1944
ALEXANDER LEROY E
9-1931
ALIKHANOV A I
9-1918
ALLEN AUGUSTINE O
9-2041
ALLEN HERBERT C JR
9-1975
ALLEN J S
9-2059
ALTSHULER S A
9-2074
ALUMINUM RESEARCH LABS
ALUMINUM CO OF AMERICA
9-1743
ALVAZYAN M T
9-1917
AMES LAB
9-1759 9-1760 9-1790
9-1994 9-2022 9-2023
ANDERSON JOHN H
9-2072
ANDERSON M J S
9-1796
ANDERSON R H
9-1893
ANDERSON WILLIAM J
9-1813
ANDREW KENNETH F
9-1877
ARCOS CORP
9-1860
ARGONNE NATIONAL LAB
9-1804
ARMBRUSTER RAYMOND
9-2010
ARMOUR RESEARCH
FOUNDATION
9-1841 9-1842 9-1843
9-1844 9-1845 9-1850
ARMY MEDICAL RESEARCH
LAB FORT KNOX
9-1710 9-1783
ASKOWITH JOSEPH G
9-1926
ATOMIC ENERGY PROJECT
UNIV OF CALIF
LOS ANGELES
9-1764 9-1966
ATOMIC ENERGY PROJECT
UNIV OF ROCHESTER
9-1728
ATTIX FRANK H
9-2045

BALDIN A
9-1984
BALLAM J
9-1969
BALLANTINE DAVID S
9-1781 9-1785
BANKS CHARLES V
9-1759
BARNES J W
9-1762
BARNES R G
9-2012
BATES C C
9-1819
BATES C J
9-1715
BATES THOMAS F
9-1826 9-1827
BATTELLE MEMORIAL INST
9-1798 9-1799 9-1800
9-1801 9-1802 9-1820
9-1837 9-1839 9-1849
9-1851 9-1854 9-1856
9-1857
BAUSCH AND LOMB OPTICAL
CO
9-2051
BAXTER ROBERT C
9-1705
BEAK V
9-1791 9-1869 9-1958
BECK WILLIAM S
9-1764
BELKOV GREGORY
9-1748
BELL W A
9-1955 9-1956 9-1957
BELLACK STEVE
9-1710
BELYAEV L M
9-1758
BENBOW J N
9-1840
BENE A A
9-1967
BENEDEK G B
9-2011
BENNETT A I JR
9-1935
BERGER MARTIN J
9-2076
BERGER S
9-1953
BERGSTRESSER KARL S
9-1761
BERLOVICH E E
9-1969
BERNANOSE ANDRE
9-1974
BERNARD MICHEL-YVES
9-2024
BHAGAT S M
9-1906
BIRKS LAVERNE S
9-1945
BISHOP TOM
9-1891
BLACKMORE R H
9-1800
BLANC DANIEL
9-1973
BLANK LEO
9-1721
BLOCK B P
9-1752
BLOCKER H G
9-1789
BLONDEL F
9-1830
BOARTS R M
9-1807
BOATO GIOVANNI
9-1834
BOEHM F
9-2058
BOICOURT GRENFELL P
9-1971
BONNER WILLIAM A
9-1755 9-1756
BORG ARTHUR C
9-1814
BOSTICK WINSTON H
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BRAESTRUP C B
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BRAUNER A R
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BRAY P J
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BRECHER GEORGE
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BREHM RICHARD K
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BRODSKII A M
9-1936
BRODY T A
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BROLLEY JOHN E JR
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BROMLEY D A
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BROOKHAVEN NATIONAL LAB
9-1781 9-1962 9-1963
BROWNE C I
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BRUCER M
9-1979
BRUTCHER HENRY
9-1865 9-1866 9-1867
BUCUR EUGENE
9-1859
BUREAU A J
9-2022 9-2023
BUREAU OF MINES EASTERN
EXPERIMENTAL STATION
9-1895
BURGWALD G M
9-1977
BURNS VICTOR W
9-1712
BUSTAD L K
9-1703
BUTTRAM H J
9-1957

CAMILLI ELENA
9-1826
CAMPBELL J E
9-1708
CARBIDE AND CARBON
CHEMICALS CO Y 12
9-1961
CAREW WILLIAM F
9-1845
CARLSON R L
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CARTLEDGE G H
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CASE K M
9-1938
CASE INST OF TECH
9-1848
CAUCHOIS YVETTE
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CAWTHORNE E W
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CAYREL ROGER
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CERTAINE J
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CHAKRAVARTI P B
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CHAMBERS DAVID H
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CHATTERJEE S
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CHELEMER HAROLD
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CHEVALLIER PIERRE
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CHIZHIKOVA Z A
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CHOU C N
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CHU TSAI
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CLARK A M
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CLAYTON JOHN C
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CLIFCORN L E
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COHEN VICTOR W
9-2006
COLLADAY G S
9-1777
COLLINS CLAIR J
9-1755 9-1756
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COLUMBIA UNIV SCHOOL OF
MINES
9-1861
CONSOLIDATED VULTEE
AIRCRAFT CORP
9-2027 9-2028 9-2029
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COOK MELVIN A
9-1905
COOPER JOHN N
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COOPER L N
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CORMACK A M
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CORMACK D V
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COWAN HELEN D
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9-1896
CRAIGHEAD C M
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CRANDALL WALTER E
9-1993
CRANE CO
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CRANE W W T
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CREAMER ROBERT M
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CRONKITE EUGENE P
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CROSSLEY FRANK A
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CULCHETH LABS RESEARCH AND DEVELOPMENT BRANCH INDUSTRIAL GROUP UNITED KINGDOM ATOMIC ENERGY AUTHORITY ENGLAND
9-1745
CUTLER JOHN L
9-1717

DAILEY B P
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DANGERFIELD A D
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DANIELS FARRINGTON
9-1964
DANSGAARD WILLI
9-1952
DAVID SARNOFF RESEARCH CENTER
9-1893
DAVIS F J
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DAVISON S
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DEBENEDETTI S
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DEMOS A C
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DEMRICK CARL
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DEPARTMENT OF MINES AND TECHNICAL SURVEYS MINES BRANCH CANADA
9-1944
DESTRO V P
9-1727
DETKOV S P
9-1883
DE VRIEND J A
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DEWALD JACOB F
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DIAGUILA A J
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DIZAR Z I
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DMITRIEV A G
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DOLAN T J
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DOLAPCHIEV B L
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DOLSEN C P
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DORMAN L I
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DOUGLAS DAVID L
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DOW CORNING CORP
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DRAGANIC I G
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DRAGANIC Z D
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DUCKWORTH W H
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DUPONT DE NEMOURS E I AND CO EXPLOSIVES DEPT ATOMIC ENERGY DIV
9-1942
DUQUESNE MAURICE
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DURBIN PATRICIA W
9-1709
DZHELEPOV B S
9-1970 9-1998

EASTWOOD W S
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ECKERT ERNEST R G
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EDGELL WALTER F
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EDWARDS R E
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EFFINGER R T
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EISERMANN F
9-1890
ELISEEV G P
9-1918
ELLINWOOD L EDWARD
9-1711
ELLSWORTH R D
9-1798 9-1799 9-1800
9-1801 9-1802
ENATSU HIROSHI
9-2007
ENNOR W T
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ERICKSON E S JR
9-1827
EVERHART JOHN L
9-1892

FAMULARO K F
9-2073
FARRAR PAUL
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FASSELL VELMER A
9-1760 9-2082
FEITELBERG SERGEI
9-1981
FELDSTED E T
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FEOFILOV P P
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FERNELIUS W CONARD
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FERRONI S
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FEUVRAIS LOUIS
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FICKETT W
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FINDLEY WILLIAM N
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FLUGEL GUSTAV
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FLUID MOTION SUB COMMITTEE AERONAUTICAL RESEARCH COUNCIL GREAT BRITAIN
9-1803
FOOTE MINERAL CO
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FOREMAN HARRY I
9-1739
FORLAND TORMOD
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FOUDRIAT E C
9-1800
FOWLER R JR
9-1822
FRENCH G A
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FRICK RUTH
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FRISCH H L
9-1912
FROEHLICH FRITZ W
9-1925
FRY W F
9-1985
FUBINI S
9-2049
FUHRMANN HANS
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FURCHNER JOHN E
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FURNO EDWARD J
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GABRIELI ELEMER R
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GABRYSH A F
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GALANIN A D
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GALLAGHER JAMES D
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GALLMANN ANDRE
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GANDELMAN G M
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GARDINER LYNN
9-1829
GARDNER DWIGHT E
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GARIBYAN G M
9-1937
GARNER CLIFFORD S
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GARRETT C
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GARRETT JANE R
9-1789
GATTO R
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GAUS H
9-2015
GAUZIT MAURICE
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GENERAL ELECTRIC RESEARCH LAB
9-1864
GEORGE L A
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GEORGIA INST OF TECH ENGINEERING EXPERIMENT STATION
9-1789
GEYER SAMUEL V
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GILBERT D A
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GILLIESON A H C P
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GILVARRY J J
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GINDLER J E
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GINZBURG V L
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GOLD G LENNARD
9-1735 9-1736
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GOLDANSKII V I
9-1920
GOLDBLITH S A
9-1715
GOLDSCHMIDT-CLERMONT Y
9-1987
GOLDSWORTHY JOSEPH
9-1817
GOOD R S
9-1827
GOOD W D
9-1775
GOODMAN L S
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GORODETZKY SERGE
9-2010
GOTTFELD F H
9-1983
GOTTLIEB M B
9-1928
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9-1750
GOVE H E
9-2019
GRAND JUNCTION OPERATIONS OFFICE AEC
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GRANT NICHOLAS J
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GRAYDON W F
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GREEN D WAYNE
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GREGOR HARRY P
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GRUNER JOHN W
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GRUZIN P L
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GULBRANSEN EARL A
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GUREVICH M A
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GVOZDOVER S D
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HAAS L L
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HALLDEN NAOMI
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HAMANN A
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HARRIS D L
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HARRIS J W
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HARRIS JAMES C
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HASEBE TOMIMARO
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HEIBERG E
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HENSLER J RAYMOND
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HERING H
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HERR E B JR
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HERR WILFRID
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HORIZONS INC
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HORTON C A
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HUDSWELL F
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HUTCHISON CLYDE A JR
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HYDE EARL K
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HYLER W S
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IEVSKAYA N M
9-2013
ILLINOIS INST OF TECH
9-1741
ILLINOIS UNIV
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IMIRIE G W
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INGHRAM M
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INGLES T A
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INSTITUTE FOR THE STUDY
OF RATE PROCESSES
UNIV OF UTAH
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IOFFE B L
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ISE JOHN JR
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IVANENKO D D
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IZATT REED M
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JACQUET PIERRE A
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JAFFE H
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JARRETT A A
9-1953
JASTROW ROBERT
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JECH CESTMIR
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JENTSCHKE W K
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JERVIS M W
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JONES E A
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JONES R H
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KAITMAZOV S D
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KAMMER E W
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KAN B
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KAVETSKIS V I
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KEARNS W H
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KEITH J N
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KELLY W H
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KENNEDY ROBERT J
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KENNEDY WILLIAM R
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KENTUCKY RESEARCH
FOUNDATION UNIV OF KY
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KEREIAKES J G
9-1783
KERIMOV B K
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KESSLER HAROLD D
9-1841 9-1842 9-1843
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KHOLNOVA E A
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KIBARTAS V V
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KLINGLER QWENTIN G
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KOCHARYAN N M
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KREMER D A
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KRISHTAL M A
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KRUSE U
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KRUZHILIN G N
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KULP J LAURENCE
9-2004
KUNKEL W P
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KURTEPOV M M
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KUSMIEREK B
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KYKER GRANVIN C
9-1725

LA BELLE CHARLES W
9-1731
LABORATORIES FOR
RESEARCH AND
DEVELOPMENT FRANKLIN
INST
9-1855 9-1862
LANDAU L D
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LANG E J
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LANGEVIN MICHEL
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LE ROUX ALBERT
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LEVI CHRISTIANE
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LEVI HILDE
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LEVINE CHARLES A
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LEVINE MORTON A
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LEVINGER J S
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LEVINTOV I I
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LEWIS WILLIAM N
9-1886
LEWIS FLIGHT PROPULSION LAB NACA
9-1805 9-1813
LIEBERMAN D S
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LILLEHEI C WALTON
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LIND R
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LOEVINGER ROBERT
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LONG GEORGE
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LONSJO O
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LORIERS JEAN
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LOS ALAMOS SCIENTIFIC LAB
9-1705 9-1711 9-1739
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LOVE L O
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LU D C
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LUCAS ARTHUR C
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LUEDEMANN LOIS WEISER
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LUFT N W
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LYON W S
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MCCLINTOCK FRANK A
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MACDONALD L D
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MCGINNIS CARL L
9-2056
MCHARGUE C J
9-1836
MACHTA L
9-1990
MCPHERSON DONALD J
9-1841 9-1842 9-1843
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MAISE C RICHARD
9-1828
MAMASAKHLISOV V I
9-2017
MANESCU IOANA
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MANGHAM J R
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9-1806
MANOWITZ BERNARD
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MARINELLI L D
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MARMIER P
9-2058
MARQUET GERARD
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MARSHALL J
9-2036 9-2039
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MARTIN D C
9-1839 9-1849
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MARTINOVITCH PETAR N
9-1733
MARUCCI HORACE D
9-1732
MASSACHUSETTS INST OF TECH
9-1815 9-1816

MATERIALS LAB ALLISON DIV GENERAL MOTORS CORP
9-1840
MATHER K B
9-2037
MATHUR HIRDAYA B
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MATSUNAGA M
9-1948
MATTRAW H C
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MAXSON D R
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MEERSON G A
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MELTON T M
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MENDLOWITZ H
9-1938
MENTEN MAUD L
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MEREDITH L H
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METALLURGICAL LABS DOW CHEMICAL CO
9-1852
MEUSCHKE J L
9-1832 9-1833
MEYERHOF W E
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MIKHAILOV V
9-1984
MILLBURN GEORGE P
9-1993
MILLER C E
9-1980
MILLER C W
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MILLNER T
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MILLS W R
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MINAMI SHIGEO
9-2044
MINE SAFETY APPLIANCES CO
9-1806 9-1897 9-1898
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MINNESOTA UNIV
9-1829
MIROLO P L
9-1851
MITCHELL W I
9-1846
MOON KENNETH A
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MOONEY R T
9-1726
MORAND MAX
9-1924
MORGENSHTERN Z L
9-1758
MORKEN DONALD A
9-1728
MORREY JOHN R
9-1742
MORRIS JOHN
9-1817
MOUND LAB
9-2054
MOXHAM R M
9-1831
MUMM J F
9-1804
MURCH R M
9-1767
MURIN A N
9-1958

NAHMIAS MAURICE E
9-1914
NATIONAL BUREAU OF STANDARDS
9-2076
NATIONAL INST OF ARTHRITIS AND METABOLIC DISEASES NATIONAL INSTITUTES OF HEALTH
9-1720
NAVAL MEDICAL RESEARCH INST BETHESDA
9-1720 9-1779
NAVAL RADIOLOGICAL DEFENSE LAB
9-1991
NAVAL RESEARCH LAB
9-1945 9-2098
NEFEDOV V D
9-1958

NEFF JOSEPH A
9-1751
NELSON G A
9-1887
NELSON RAYMOND A
9-1774
NEMETH ZOLTON N
9-1813
NETHERCOT A H JR
9-2097
NIELSEN ALVIN H
9-1766
NIELSEN J P
9-1776
NIKOLAEV N S
9-1768
NOBEL DEANA
9-1750
NORWOOD W D
9-1722
NOSKOV B M
9-1884
NOVIK R M
9-1791
NOVOZHILOV YU V
9-2093 9-2094
NUCLEAR DEVELOPMENT ASSOCIATES INC
9-2031
NYGARD JOHN C
9-2025

OAK RIDGE NATIONAL LAB
9-1825 9-1893
OAK RIDGE NATIONAL LAB Y-12 AREA
9-1955 9-1956 9-1957
OAKLEY W D
9-1703
OBERLE E M
9-1715
OCON CARLOS VELEZ
9-2014
OGDEN H R
9-1837 9-1856 9-1870
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OLIN MATHIESON CHEMICAL CORP
9-1741 9-1742 9-1763
OREGON STATE COLL
9-1784
ORMONT B F
9-1866
ORR CLYDE JR
9-1789
OSBORNE L S
9-1987

PACK DOUGLAS H
9-1742
PAPINEAU LILY
9-2071
PARR W H
9-1783
PARROTT MARSHALL W
9-1709
PASSELL T O
9-2063
PATCHING S W F
9-1830
PATTERSON C
9-1835
PAUL E B
9-2019
PEKAR S I
9-2091
PEKER L K
9-1999
PENNSYLVANIA STATE UNIV
9-1738
PENNSYLVANIA STATE UNIV COLL OF MINERAL INDUSTRIES
9-1744 9-1826 9-1827
PENNSYLVANIA UNIV
9-1763
PERIO P
9-1794 9-1795
PERLMAN I
9-2063
PHILLIPS PETROLEUM CO ATOMIC ENERGY DIV
9-2050
PIERCE O R
9-1767
PLACZEK G
9-2048
PLEASONTON FRANCES
9-2078
POLAROID CORP
9-1965

POLYTECHNIC INST OF BROOKLYN 9-1912
POMERANCHUK I YA 9-2032 9-2092
POOLE LORIN K 9-1860
POSPEKHOV D A 9-1748
POTRATZ HERBERT A 9-1762
PRATT WILLIAM W 9-2020
PRESTON J H 9-1803
PROCTOR B E 9-1715
PURCELL E M 9-2011

QUESNEY JOSIANE 9-1788

RABIDEAU SHERMAN W 9-1740
RABINOVITCH B S 9-1772
RABKIN ESTHER 9-1930
RADIATION LAB UNIV OF CALIF BERKELEY 9-1712 9-1863
RADIOLOGICAL LAB UNIV OF CALIF SAN FRANCISCO SCHOOL OF MEDICINE 9-1723
RAND CORP 9-1863
RAPOPORT L P 9-2088
RAU R RONALD 9-1989
RAUCH R 9-1798
REED J F 9-1772
REIFFEL L 9-1977
RESEARCH FOUNDATION OHIO STATE UNIV 9-2026
REYNOLDS GEO T 9-1988 9-1989
RICHARDSON R J 9-1707
RIEMAN WILLIAM P 9-1964
RIPLING E J 9-1848
RISSER J R 9-1975
ROCHESTER UNIV 9-1946
RODERICK H 9-2057
RODGERS SHERIDAN J 9-1903 9-1904
RODIONOVA L M 9-1933
ROGERS BETTY S 9-1976
ROOS K 9-1893
ROSE ARNOLD S 9-1886
ROSE J E 9-1980
ROSENBLUM B 9-2097
ROSS STEVEN W 9-1991
ROSTOKER W 9-1874
ROTH FRANKLIN E 9-1721
ROWLAND R E 9-1960
ROYAL AIRCRAFT ESTABLISHMENT FARNSBOROUGH HANTS ENGLAND 9-1808
RUNNER MERVIN E 9-1741
RUTH JOHN M 9-1823 9-1824
RUTHERFORD JOHN L 9-1855
RYAN AERONAUTICAL CO 9-1838 9-1847

SACHS FRANCES L 9-1961
SALDICK JEROME 9-2041
SALIKHOV S G 9-2075
SALLER H A 9-1854
SALMASSY O K 9-1820
SALUTSKY MURRELL L 9-1757
SAMSONOV G V 9-1821
SANDEL ANNE 9-1765
SANDERS PHYLLIS C 9-1711 9-1976
SARTORIUS ROBERT 9-1747
SARUKHANIAN G 9-1811
SASAKAWA TATUYA 9-2001
SASLAW I M 9-1798
SASS L 9-1865
SAUTER CHARLES 9-1817
SCHECTER LARRY 9-1993
SCHEIN MARCEL 9-1929
SCHINZ H R 9-2038
SCHNEPS J 9-1985
SCHOENBORN HENRY W 9-1716
SCHOFIELD H Z 9-1820
SCHOPPER E 9-1940
SCHULER ROBERT H 9-1782
SCHULTEN R 9-2015
SCHUMACHER B 9-1940
SCHWEITZER WILLIAM 9-1711
SCHWOPE A D 9-1820
SCOTT ALLEN B 9-1784
SCOTT D W 9-1775
SCOTT JAMES K 9-1731
SCOTT JOHN 9-1817
SCOTT M 9-1987
SECREST E LEIGH 9-2029
SHELLABARGER C J 9-1709
SHERR R 9-2064
SHIROKOV V I 9-1884
SHOEMAKER WILLIAM C 9-1732
SHORT N M 9-1826
SHTEINBOK N I 9-1968
SIDORENKO G A 9-1933
SIEGFRIED W 9-1890
SILIN V P 9-2034 9-2083
SILVERMAN EUGENE N 9-1826
SIMMONS B E 9-2073
SIRKAR G N 9-1932
SITENKO A G 9-2043
SITTE KURT 9-1925 9-1926
SKAGGS LESTER S 9-2025
SLIV L A 9-1910 9-1999
SLOTH ERIC N 9-1749
SMALLER B 9-1776
SMIRNOV M V 9-1883

SMITH D D 9-1767
SMITH DEANE K 9-1829
SMITH FRANK A 9-1730
SMITH RAYMOND L 9-1855
SMITH SCOTT W 9-2047
SNELL ARTHUR H 9-2078
SOKOLOV A A 9-2000
SOLIMENE N 9-1771
SOLMITZ F 9-2039
SOLOMON A K 9-1735 9-1736
SOLOMON A L 9-1893
SOMMER A H 9-1893
SPACKMAN W JR 9-1827
SPARKS CULLIE J JR 9-1836
SPELLMAN MITCHELL W 9-1721
SPENCER L V 9-2045
SPRAKER W A 9-1799 9-1800 9-1801 9-1802
SPRATT EUGENE C 9-1704
STACY J T 9-1854
STANDARD OIL CO OF IND 9-1814
STANNARD J NEWELL 9-1705
STEARNS M 9-1909
STEARNS M B 9-1909
STEIN CHARLES 9-1876
STEPHENSON C V 9-1769
STERNHEIMER R 9-1962 9-1963
STERZER FRED 9-1773
STEVENS C M 9-2055
STEWART R J 9-1753
STICHA E A 9-1858
STITES JOSEPH G JR 9-1757
STOKINGER H E 9-1731
STONE BOB D 9-1757
STORER J B 9-1710
STORER JOHN B 9-1711
STOREY ROBERT H 9-1737
STRAHL ERWIN O 9-1826
STRAUSS HERBERT D 9-1732
STREBE FRANK C 9-1966
STROHBECK D D 9-1846
STROUP P T 9-1743
STUART R V 9-2073
STUDIER M H 9-2055
SUJISHI SEI 9-1741
SWAKON EDWARD A 9-1814
SYLVESTER GEORGE E 9-1731

TABERN D L 9-1737
TALBOYS ALBERT P 9-1704
TALLEY L H 9-1708
TALLEY ROBERT M 9-1766

TANANAEV I V
9-1768
TAYLOR J R
9-1903 9-1904
TECHNICAL INFORMATION SERVICE AEC
9-2077
TENNESSEE UNIV
9-1807
TENNESSEE VALLEY AUTHORITY WILSON DAM ALA
9-1746
THIELSCH HELMUT
9-1888
THOMAS R G
9-1996
THOMPSON ROY C
9-1703
THOMPSON S G
9-2021
TIDBALL ROBERT A
9-1806
TIDBURY D
9-1983
TIETZ T
9-2096
TILTON G
9-1835
TITTERTON E W
9-1701
TOBOCMAN W
9-1997 9-2095
TOLER HERBERT R JR
9-1880
TOMASINI A
9-2003
TREIMAN S B
9-1988 9-1989
TROTTER C L
9-1827
TROUT E DALE
9-2046
TURNBULL DAVID
9-1864
TURNER D H
9-1850

ULTEE CASPER J
9-1770
UNDERWOOD NEWTON
9-1951
UZHIK G V
9-1867

VAINSHTEIN B K
9-2033
VAN ALLEN J A
9-1928
VANECHO JOHN A
9-1854
VAN HOVE L
9-2048
VAN LIEMPT J A M
9-1893
VAN PATTER D M
9-2073
VERLE I I
9-2085
VERMA R K
9-1932
VETTER KLAUS J
9-1868
VIDOVIC VLADO L
9-1733
VIRGINIA-CAROLINA CHEMICAL CORP
9-1792
VOLCHOK HERBERT L
9-2004
VOLDRICH C B
9-1851
VOLKENSHTEIN F F
9-1930
VORESS HUGH E
9-2077

WABER JAMES T
9-1823 9-1824
WACHTER JOHN W
9-1961
WADDINGTON GUY
9-1775
WAFFLER H
9-2038
WAGNER F C
9-1859
WAKERLIN R C
9-1727
WALL N S
9-1946
WASE ARTHUR W
9-1732
WASSERBURG G J
9-1915
WATTS A A
9-1837 9-1875
WATTS H V
9-1977
WEEKS JAMES L
9-1879
WEEKS MAURICE H
9-1703
WEILL ADRIENNE R
9-1882
WEISZ HERBERT
9-1786
WELLER G S
9-2028
WESTERN GEAR WORKS
9-1817
WESTINGHOUSE RESEARCH LABS
9-1935
WEXLER S
9-2005
WHITE CHARLES E
9-1895
WHITMORE G F
9-1978
WIEDENBECK M L
9-2062
WILLIAMS H J
9-1903 9-1904
WILLIAMS R D
9-1851
WILLIAMS R E
9-1838 9-1847
WILLMS M
9-1718
WILSON HERBERT B
9-1731
WING A B
9-1945
WISCONSIN UNIV
9-1964
WOLPERS C
9-1707
WOODRUFF L V
9-2027 9-2030
WORKMAN B J
9-2028
WRIGHT HAROLD D
9-1826
WRIGHT MARY D
9-1808

YANOSHI I L
9-1919
YASAITIS E L
9-1778
YOCOM J E
9-1798 9-1799 9-1800 9-1801
YOSHIKAWA SADAE
9-2002
YUASA TOSIKO
9-2080
YURKOV V A
9-1869
YUTSIS A P
9-2086 9-2087

ZARUBIN P P
9-2068 9-2069
ZHARKOV G F
9-2084
ZHDANOV G B
9-1920
ZHUKOVSKII N N
9-1970
ZHVANKO YU N
9-1933
ZINDLER G F
9-1951
ZYZES F C
9-1822

NUCLEAR SCIENCE ABSTRACTS

Volume 9 March 31, 1955 No. 6A

NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability.

This Numerical Index of Reports is divided into two parts: Part I—all reports abstracted or listed in the current issue of *Nuclear Science Abstracts (NSA)*; Part II—reports abstracted or listed in earlier issues of *NSA* for which more recent availability information is provided. In addition to the report number and corresponding abstract number, the Index includes a brief statement regarding the availability of each USAEC report listed; this information is given for non-AEC reports also when it is available.

Nuclear Science Abstracts, Vol. 7, No. 24A, Dec. 31, 1953, includes a cumulated Numerical Index of Reports covering all reports in *Abstracts of Declassified Documents (ADD)* and in *NSA*, Vols. 1-7, together with the latest availability information as of Dec. 31, 1953. Information concerning reports abstracted in *NSA*, Vol. 8, appears in *NSA*, Vol. 8, No. 24A, Dec. 31, 1954. A completely cumulated listing covering all volumes of *ADD* and *NSA* through Vol. 8 is issued as a separate publication, TID-4000. Each issue of *NSA*, Vol. 9 (1955), contains information concerning reports abstracted in that issue. This information is cumulated for the first half of the year in No. 12B, and a complete annual cumulation will appear in No. 24A (Dec. 31, 1955). In addition, each issue contains new information concerning the availability of reports previously abstracted.

In order to help identify the originator of each series of non-AEC reports, a significant word has been placed in parentheses beside the code. No parenthetical word is shown for series of reports issued by the USAEC. Information regarding the location and acquisition of non-AEC reports appears in the Introduction to this issue.

The Introduction to this issue also contains location and acquisition information to supplement the following explanations of the various types of entries found in the "Availability" column:

ENTRY	EXPLANATION
NSA	Nuclear Science Abstracts
ADD	Abstracts of Declassified Documents, the predecessor of NSA.
NNES	National Nuclear Energy Series, published by the McGraw-Hill Book Co.
Sale Price	If USAEC report, available from the Office of Technical Services. If British report, available from British Information Services.
Sale Price (GPO)	USAEC or other report for sale through the U. S. Government Printing Office.
In ...	Reports contained in published books.
Reference (Condensed)	Thesis published in condensed form.
Dep.	USAEC reports available at the All Depository Libraries as full-size copy.
Dep.(mc)	USAEC reports available at the All Depository Libraries only in microcard form. Full-size copies of such reports can be obtained on a loan basis by any All Depository Library on request to the Technical Information Service.
JCL	Available from John Crerar Library, Chicago, Ill.
LC	Available from Library of Congress, Washington, D. C.
Dep.(mc); Ind. Dep.	A report held by the other All Depository Libraries in microcard form only is available in full-size copies at the Industrial Depository Libraries.
Journal (without citation)	Report has been submitted to the journal for publication.
Journal (with specific citation)	Report has been published as cited.
USGS	Available from the U. S. Geological Survey, Washington 25, D. C.
NRC	Available from National Research Council of Canada, Ottawa, Ontario, Canada.
JENER	Available from the Librarian, Joint Establishment for Nuclear Energy Research, Kjeller per Lillerstrom, Norway.

ASSIGNED CODE DESIGNATIONS

MDDC – To declassified reports released by the Manhattan Engineer District and by the Atomic Energy Commission before March 1, 1948.

AECD – To declassified reports released by the Atomic Energy Commission after February 29, 1948 (appeared in April 15, *Nuclear Science Abstracts*).

AECU – To unclassified reports originating within the Atomic Energy Project. (Subsequent to AECU-871, this code is applied only to reports carrying no other recognized code designation.)

NP – A file designation assigned by the Technical Information Service (TIS) to nonproject reports whose codes, if present, are not practical for TIS use.

Other code designations below are assigned to unclassified reports by the originating installations.

PART I

Report	Abstract	Availability
AD (Non-AEC)		
3245	9-1820	See WADC-TR-52-67
28253	9-1836	
30810	9-1738	
31826	9-1837	
31854	9-1838	
31954	9-1839	
32031	9-1840	
32191	9-1841	
32192	9-1842	
32193	9-1843	
32194	9-1844	
32611	9-1912	
32986	9-1845	
33540	9-1846	
34004	9-1789	
34369	9-1847	
34449	9-1848	
34712	9-1849	
40019	9-1808	See RAE-TN-EL-68
40234	9-1850	
40917	9-1803	
AEC-tr		
367	9-1930	See TT-167
1289	9-1748	See TT-300
1993	9-1765	JCL
1994	9-1793	JCL
1995	9-1865	Henry Brutcher (Trans. No. 3281), Altadena, Calif.
1996	9-1768	LC
1997	9-1706	JCL

Report	Abstract	Availability
AEC-tr		
1998	9-1866	Henry Brutcher (Trans. No. 3414), Altadena, Calif.
1999	9-1867	Henry Brutcher (Trans. No. 2907), Altadena, Calif.
2000	9-1809	LC
2058	9-2003	Associated Technical Services, East Orange, N. J.
2059	9-1747	Associated Technical Services (Trans. No.
2060	9-1810	LC
2061	9-1794	JCL
2062	9-1795	JCL
2063	9-1811	JCL
2064	9-1947	JCL
2065	9-1796	JCL
2067	9-1940	Associated Technical Services (Trans. No. 85F4G) East Orange, N. J.
AECU		
2949	9-1893	Dep.(mc)
2975	9-2026	Dep.(mc)
2983	9-1962	Dep.(mc)
2984	9-1963	Dep.(mc)
2996	9-1863	Dep.(mc)
AERE-Lib/Trans (British)		
449	9-1868	
463	9-1791	
464	9-1958	
465	9-1869	
474	9-1786	
486	9-1707	
498	9-1959	
501	9-1830	
AMRL (Non-AEC)		
156	9-1783	
162	9-1710	
ANL		
5276	9-1804	Dep.
ATI (Non-AEC)		
9167	9-1851	
103581	9-1894	
143770	9-1852	
173232	9-1853	
BM-RI (Non-AEC)		
5093	9-1895	
BMI		
970	9-1854	Dep.; $0.20
BNL		
317	9-1781	Dep.; $0.20
1879	9-1782	J. Chem. Phys. 22, 2026-9(1954)
1940	9-1729	Biol. Bull. 107, 329-34(1954)
2039	9-1986	Phys. Rev. 97, 181-3(1955)
2088	9-2006	Phys. Rev. 97, 243(1955)
CU (Misc.)		
20-54-AEC-904-MET	9-1861	See NYO-3968
CVAC (Non-AEC)		
198T	9-2027	
211T	9-2028	
212T	9-2029	
219T	9-2030	
DP		
95	9-1942	Dep.
ETF (Non-AEC)		
760.92-2/3	9-1798	See NP-5485
760.92-2/4	9-1799	See NP-5486
760.92-2/5	9-1800	See NP-5487
760.92-2/6	9-1801	See NP-5488
760.92-2/Final	9-1802	See NP-5489
760-274/Final	9-1964	See NP-5499
G (Non-AEC)		
17-62	9-1838	See AD-31854
17-63	9-1847	See AD-34369
HW		
33744	9-1703	Dep.(mc)
IDO		
16205	9-2050	Dep.(mc)
ISC		
405	9-1759	Dep.(mc)
489	9-2082	Spectrochim. Acta 6, 341-72(1954)
512	9-1790	Dep.(mc)
533	9-1994	Dep.(mc)
554	9-1760	Dep.(mc)
558	9-2022	Dep.(mc)
561	9-2023	Dep.(mc)
KAPL		
1248	9-1822	Dep.
LA		
1667	9-1823	Dep.
1706	9-1761	Dep.
1727	9-1896	Dep.
1730	8-1824	Dep.
1736	9-2016	Dep.
1845	9-1762	Dep.
1848	9-1711	Dep.
1851	9-1739	Dep.
1855	9-1740	Dep.
1856	9-1943	Dep.
MCC (Non-AEC)		
1023-TR-66	9-1763	
1023-TR-79	9-1741	
1023-TR-82	9-1742	
MLM		
970	9-2054	Dep.
MR (Canadian)		
A-318	9-2030	See CVAC-219T
A-336	9-2027	See CVAC-198T
N-1	9-2029	See CVAC-212T
N-5	9-2028	See CVAC-211T
NAA-AER		
1018	9-1953	Nucleonics 13, No. 1, 64(1955) (Condensed)
NACA-RM (Non-AEC)		
E52F30	9-1805	
NACA-TM		
982	9-1818	
NACA-TN (Non-AEC)		
3337	9-1813	
NBS (Misc.)		
2902	9-2076	
NDA		
15C-12	9-2031	Dep.(mc)

Report	Abstract	Availability
NP (AEC File No. for Non-AEC Reports)		
5470	9-1855	
5471	9-1743	
5472	9-1720	
5473	9-1856	
5474	9-1857	
5475	9-1944	
5477	9-1897	
5478	9-1898	
5479	9-1899	
5480	9-1900	
5481	9-1901	
5482	9-1902	
5483	9-1903	
5484	9-1904	
5485	9-1798	
5486	9-1799	
5487	9-1800	
5488	9-1801	
5489	9-1802	
5490	9-1779	
5491	9-1806	
5492	9-1935	
5493	9-1905	
5494	9-1744	
5495	9-1814	
5496	9-1858	
5497	9-1767	
5499	9-1964	
5500	9-1965	
5502	9-1859	
5505	9-1784	
NRL (Non-AEC)		
4402	9-1945	
NYO		
3498	9-1860	Dep.
3637	9-1752	J. Phys. Chem. 59, 80-4(1955)
3780	9-2051	Dep.(mc)
3791	9-2098	Dep.(mc)
3968	9-1861	Dep.
4986	9-1736	J. Gen. Physiol. 38, 389-404(1955)
4987	9-1735	J. Gen. Physiol. 38, 371-88(1955)
4990	9-1704	Dep.; $0.80
6062	9-1826	Dep.(mc)
6063	9-1827	Dep.(mc)
6114	9-1862	Dep.(mc); Ind. Dep.
6543	9-1946	Dep.(mc)
6570	9-1909	Phys. Rev. 97, 240-2(1955)
ORNL		
1833	9-1825	Dep.
ORO		
121	9-1807	Dep.
OSR-TN (Non-AEC)		
54-351	9-1815	
55-1	9-1816	
P (Misc.)		
540-AEC	9-1863	See AECU-2996
2337-8	9-1855	See NP-5470
RAE-TN-EL (British)		
68	9-1808	
RDB(C)/TN (British)		
106	9-1745	
RL (Misc.)		
1237	9-1864	See SO-2037
RME		
71	9-1828	Dep.; $0.20
3092	9-1829	Dep.
RMO		
2732	9-1746	Dep.(mc)
2944	9-1792	Dep.(mc)
SO		
2037	9-1864	Dep.(mc)
TID		
3032(Suppl. 1)	9-2077	Dep.; $0.20
TR (Non-AEC)		
125/54	9-1944	See NP-5475
TT (Canadian)		
167	9-1930	
300	9-1748	
UCLA		
305	9-1966	Dep.(mc)
321	9-1764	Dep.(mc)
UCRL		
2654	9-2060	Phys. Rev. 97, 117-20(1955)
2685	9-1993	Phys. Rev. 97, 184-7(1955)
2793	9-1709	Proc. Soc. Expti. Biol. Med. 87, 626-9 (1954)
2812	9-1712	Dep.(mc)
4386(Rev.)	9-2021	Phys. Rev. 97, 242(1955)
UCSF		
10	9-1723	Dep.
UR		
280	9-1731	Arch. Ind. Health 11, 11-16(1955)
307	9-1728	Dep.
376	9-1705	Dep.
USNRDL-TR (Non-AEC)		
15	9-1991	
WADC-TR (Non-AEC)		
52-67	9-1820	
54-37	9-1817	
Y		
577	9-1955	Dep.; $0.25
623	9-1956	Dep.; $0.25
671	9-1957	Dep.; $0.20
958(1953 Suppl.)	9-1961	Dep.

PART II

AD (Non-AEC)		
13709	8-3035	Phys. Rev. 92, 362-6(1953)
AECD		
3615	8-2253	Gen. Elec. Rev. 57, No. 5, 49-51(1954)
AECU		
2803	8-1908	J. Chem. Phys. 22, 1496-9(1954)
2804	8-1990	Phys. Rev. 94, 1103-10(1954)
2816	8-2119	Anal. Chem. 27, 141-2(1955)
2839	8-3320	Anal. Chem. 27, 63-4(1955)
2856	8-3443	Anal. Chem. 27, 167-8(1955)

Report	Abstract	Availability
AECU		
2876	8-4307	J. Chem. Phys. 23, 84-7(1955)
ANL		
5201	8-5867	Radiology 64, 94-104(1955) (Condensed)
BNL		
1781	9-1234	Nucleonics 12, No. 12, 14-18(1954)
1831	9-1211	Anal. Chem. 27, 166-7(1955)
HW		
28991	8-454	Am. J. Roentgenol. Radium Therapy Nuclear Med. 73, 303-8(1955)
ISC		
446	8-2363	J. Chem. Phys. 23, 33-43(1955)
488	8-5222	J. Am. Ceram. Soc. 38, 66-71(1955)
NBS (Misc.)		
3101	8-3237	J. Chem. Phys. 22, 2051-8(1954)
NM (Non-AEC)		
006.012.04.70	8-6631	Proc. Soc. Exptl. Biol. Med. 86, 664-8 (1954)
NRL (Non-AEC)		
4248	8-784	J. Chem. Phys. 23, 113-17; 130-5(1955)
NYO		
4023	8-2089	Arch. Biochem. Biophys. 54, 6-14(1955)
6257	9-1486	Mining Eng. 6, 1196-1202(1954)
6404	8-6085	J. Am. Chem. Soc. 77, 261-4(1955)
6574	9-790	Phys. Rev. 96, 812(1954)
ORNL		
1675	8-4551	Anal. Chem. 27, 70-2(1955)
1682	9-750	$0.20
UCLA		
284	8-2278	Arch. intern. pharmacodynamie 100, 120-6(1954)
298	8-4860	Am. J. Physiol. 179, 462-6(1954)
UCRL		
2412	8-2506	Part A in Phys. Rev. 97, 172-80(1955)
2593	8-6844	Electronics 28, No. 2, 164-9(1955) (Condensed)
2635	8-6433	Biochim. et Biophys. Acta 15, 461-70 (1954)
USNRDL (Non-AEC)		
365	7-720	Am. J. Roentgenol. Radium Therapy Nuclear Med. 73, 294-302(1955)
386	7-2962	Arch. Biochem. Biophys. 54, 146-53(1955)
419	8-2095	Am. J. Physiol. 179, 541-8(1954)
WAPD-T		
186	8-6156	Chem. Eng. Progr. 50, Symposium Ser. No. 12, 16-22(1954)